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Trends

Bunker C Fuel Oil Advances 35 Cents On Atlantic Coast

THE price for Bunker C fuel oil at refineries and terminals in the New York harbor area and several other Atlantic seaboard points last week advanced to $1.50 per barrel, the highest level in over 12 years. This posting was made by the largest seller in that area. The New York bunker market, one of the most important of the entire industry, has fluctuated in recent years between a low of 60 cents, in effect the latter part of 1931, to $1.35, the high of 1937. The price dropped to 95 cents, the quotation prevailing the latter part of 1938 and the early part of this year and then recovered to $1.15 when the 35-cent increase was announced last week.

Prices on marine diesel oil in the same area advanced 20 cents per barrel and there were important increases in other grades of light fuel oils. While these products have had a strong market position for several months, the increases last week were primarily a reflection of the increased tanker rates. These rates, which are now approximately 60 cents per barrel in shipments from the Gulf Coast, have tripled since the start of the war.

CRUDE PRODUCTION *3,866,550 bbl. daily average—up 11,220 bbl. One year ago 3,457,685 bbl.*

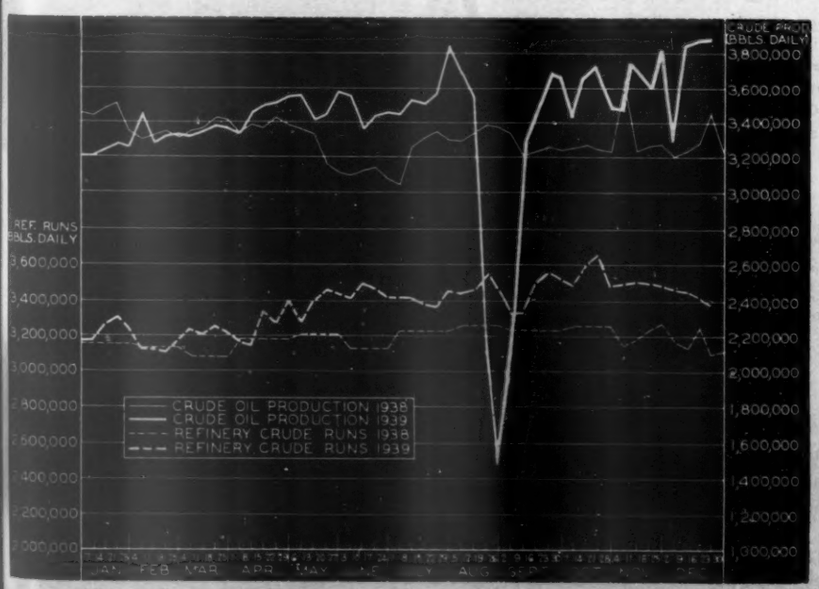
CRUDE STOCKS *232,615,000 bbl. as of December 16—up 599,000 bbl. One year ago 269,931,000 bbl.*

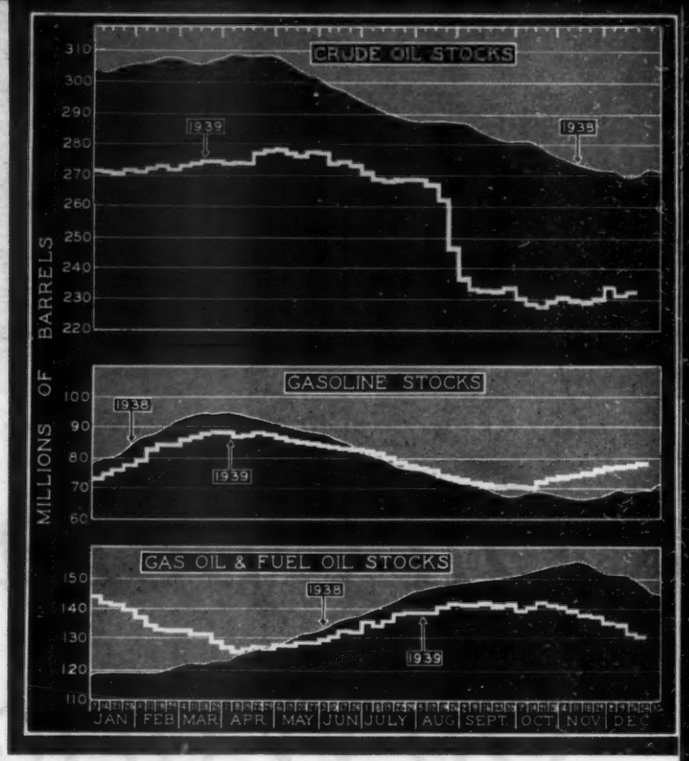
GASOLINE STOCKS *78,707,000 bbl. as of December 23—up 549,000 bbl. One year ago 71,126,000 bbl.*

GAS AND FUEL-OIL STOCKS *130,109,000 bbl. as of December 23—down 2,054,000 bbl. One year ago 146,755,000 bbl.*

REFINERY RUNS *3,395,000 bbl. daily week ended December 23—down 20,000 bbl. One year ago 3,160,000 bbl.*

During the year which ends Sunday, the oil industry has established several new yearly records. The demand for products classed as gasoline, kerosene, distillate and gas oil exceeded any previous year's, with increases


CRUDE PROD BBLS. DAILY
REF. RUNS BBLS. DAILY
CRUDE OIL PRODUCTION 1938
CRUDE OIL PRODUCTION 1939
REFINERY CRUDE RUNS 1938
REFINERY CRUDE RUNS 1939
JAN FEB MAR APR MAY AUG


CRUDE OIL STOCKS
GASOLINE STOCKS
GAS OIL & FUEL OIL STOCKS
MILLIONS OF BARRELS
1938
1939
JAN FEB MAR APR MAY JUN JULY AUG SEPT OCT NOV DEC

ranging from 4.5 to 15.5 per cent. The demand for lubricating oils, wax, and residual fuel oils was greater than in 1938, and the market for these products is particularly strong as the year closes.

The statistical and market positions of these finished products in the last week of 1939 was favorable, with the exception of gasoline. The gasoline market has been weak over a large part of the year and wholesale and retail quotations have dropped to the 1932 lows. Stocks are 8 million barrels greater than a year ago.

DAILY AVERAGE PRODUCTION FOR WEEK

	Dec. 23, 1939	Bur. Mines Dec. est. of demand	Dec. state allowables	Dec. 16, 1939
Oklahoma City	109,150	.....	.....	108,900
Seminole fields	38,275	.....	.....	36,375
Remainder of state	288,350	.....	.....	287,025
Total Oklahoma	435,775	437,600	437,600	432,300
East Texas	492,850	.....	.....	493,748
West Texas	270,040	.....	.....	269,757
North Central Texas	129,106	.....	.....	131,535
Texas Panhandle	92,000	.....	.....	72,807
East Central Texas	93,342	.....	.....	98,145
Gulf Coast Texas	405,506	.....	.....	402,261
Southwest Texas	105,247	.....	.....	102,030
Total Texas	1,588,091	1,438,100	1,415,843	1,570,283
North Louisiana	69,535	.....	.....	70,710
Gulf Coast Louisiana	199,648	.....	.....	207,796
Total Louisiana	269,183	255,200	255,200	278,506
California	621,250	594,500	599,000	615,950
Kansas	183,750	168,000	170,600	182,450
Arkansas	70,145	56,100	69,442	69,930
Eastern fields	101,220	104,600	.....	103,000
Illinois	334,684	315,200	.....	343,825
Michigan	66,162	61,000	.....	67,036
New Mexico	110,460	110,000	110,000	109,800
Rocky Mountain area	85,830	79,400	.....	82,250
Total United States	3,866,550	3,619,700	.....	3,855,330

The preliminary estimate for 1939 domestic crude-oil production is 3,420,670 bbl. daily, an increase of 130,670 bbl. over the 1938 average. All of this average gain can be accounted for by the increase in Illinois, which jumped from 66,000 bbl. daily in 1938 to approximately 256,000 bbl. this year. As the year closes these average figures are of little value, as national production over the past 2 weeks jumped to all-time highs of more than 3,850,000 bbl. daily, an increase of more than 500,000 bbl. daily over the same period last year. With changes for the last 2 weeks of the year unreported, it is estimated that crude-oil stocks in 1939 were reduced 35,000,000 bbl. and refinery stocks 25,000,000 bbl. Crude stocks are the lowest since 1922.

Y. P. F. tanker "San George," latest ship added to the company's oil fleet

Modern quarters of Venezuelan workers in the Lagunillas field

Oil Operations Expand On World-Wide Front

By
C. O. WILLSON
H. STANLEY NORMAN

THE world petroleum industry in the year now being brought to a close expanded its operations in all directions. It produced and refined into finished products more crude oil than in any previous year.

Despite the uncertainties brought about by another world war—the scope and intensity of which are yet to be determined—there is every indication that the production and consumption records of 1939 will be exceeded in 1940.

Outside the United States, the area to whose developments this International Number is primarily devoted, a great majority of the countries produced more crude oil than ever before. Nations establishing new yearly records were Canada, Argentina, Bolivia, Colombia, Ecuador, Venezuela, Trinidad, Albania (Italy), Germany, U.S.S.R., Egypt, Netherland East Indies, and Saudi Arabia. The production of the United States was about 4 per cent greater than in 1938 but slightly less than the record year of 1937.

The search for new petroleum reserves is being carried on on a wider world front than ever before. New uses and the steady expansion of the old have caused petroleum to be the most sought-after mineral resource over a large part of the world. Geological crews equipped with new exploratory tools have been sent to the remotest sections with the hope that their work will result in the discovery of new oil-bearing structures which, if not needed now, will give a backlog of proven reserves for the still greater needs of the next 5 to 25 years.

Previous to the start of the war on September 1 major refinery-construction programs were either under way or planned for the latter part of this year or early 1940. Part of this work has been temporarily postponed due to the European hostilities. Operators of refineries outside the United States have perfected and expanded their operations until their equipment and processing methods are on a par with those of this country. The expected war needs were a factor in many of the recent construction programs. The need of motor fuels high in antiknock rating for aviation service resulted in new cracking, reforming, and polymerization units being built at several refineries. Other units have been designed to supply quality diesel fuels which are particularly important in many markets outside the United States.

Effect of War

While there had been no major disruptions to petroleum supplies and demand after 4 months, it was apparent that if the war continues it will have increasing operating significance to the point where the international oil picture may undergo important changes in 1940.

So far the war has not increased the overall demand for petroleum. This is a reflection of the manner in which the war is being conducted, the limitations that have been placed on civilian consumption of petroleum and restrictions in shipping facilities. Available information indicates that there has been some increase in the use of petroleum by war machinery. Due to the stale-

INTERNATIONAL FEATURES

The principal section of this International Number starts on Page 66.

The Foreign Language Section, (English and Spanish) devoted to the latest developments in operating practices, starts on Page 190.

At the right are C. F. Atwell, engineer in charge of constructing the South American Gulf Oil Co.'s Colombian pipe line, and C. B. Williams and Bill Schaeffer, superintendent and chief engineer, respectively, of Colombian Petroleum Co. At lower right is seen the loading of a generating unit in one of the two trimotored planes used to transport all types of equipment to the interior operating centers of Colombia. At lower left is seen a view of topping-cracking units of the Ancap refinery at Montevedeo, Uruguay. Workmen's dwellings in background

mate that has existed from the start of the war in regard to land operations, except for the early invasion of Poland, and the restricted activities of air and water forces, the increase in the war consumption of the Allies has been less than expected and any increases have been partially offset by the reduced non-war consumption.

Kerosene Demand Strengthened

The rationing has been particularly significant in the case of gasoline. The restrictions have been so severe in Great Britain and France that these countries have been able to substantially reduce their purchases in the United States. Due to the greater use for light and fuel, as a result of the blackouts and the movement of the population from cities to the country, the demand for kerosene and light distillates has expanded and for several weeks after the war started there was a large increase in the demand for lubricating oils. The enlarged requirements of the Allies' navies for heavy fuel oils have been partially offset by the widespread curtailment of world shipping as a result of the war. Reports also show that the petroleum requirements of some of the European neutral nations have decreased due to the rationing, made effective as economic measures shortly after the war started.

The petroleum demand of the British Isles and France previous to the war totaled approximately 400,000 bbl. daily supplied by widely scattered sources including Iran, Iraq, Rumania, Colombia, Venezuela, and the United States, with the last two named countries the most important. The reduction in purchases of gasoline in this country by the Allies, for which shipping conditions in the war area are in part responsible, is the most important development so far reported.

On the German side, the war immediately shut off approximately 65 per cent of the 150,000 bbl. daily petroleum needs of that country. Oil imports totaling about 100,000 bbl. daily came from several petroleum countries the most important of which were the refineries in the Netherland West Indies and the United States. Previous to the war Germany was Mexico's largest export customer. With a total crude-oil production of less than 15,000 bbl. daily and an output of petroleum substitutes less than one-third its total requirements, Germany has suffered more than other belligerents in regard to oil supplies. Presumably the country has been forced to draw heavily on its inventories to supply its petroleum requirements over the past 4 months.

Reports at the close of the year indicated that Germany had completed arrangements to double its purchases from Rumania whose production due to many operating difficulties has decreased during the past year. With a total production of approximately 125,000 bbl. daily, Rumania's exportable surplus in excess of domestic requirements is about 65,000 bbl. daily. It is predicted that beginning in the early part of 1940, Germany will be purchasing the bulk of these Rumanian exports. This would still leave Germany short of its peacetime requirements with no other outside sources of supply except the U.S.S.R. whose domestic outlets over the past 2 years have been absorbing practically all of its petroleum output.

The U.S.S.R. and Germany added very little to their petroleum resources in the September division of Poland. Its petroleum properties, part of which were destroyed by Polish owners before evacuation, were producing 10,000 bbl. of crude oil daily from thousands of old settled wells.

1940 War Needs

As to the war needs in 1940, most observers agree

that the requirements of the Allies will probably increase starting early in the year. It is assumed that France and Great Britain and some of the European neutral countries have been drawing on their storage in recent weeks to supply part of their current requirements. The Allies were credited with having approximately 6 months' storage at the start of the war. Germany will be compelled either to further curtail its civilian consumption or increase is production of substitutes, or devise means of importing supplies from distant countries.

The war, coupled with the revised neutrality act of the United States which became effective in November, is necessitating major adjustments in the movement of tankers. A shortage of tankers has developed at several points, including the movement from the Gulf Coast to Atlantic-seaboard points, where rates have tripled in recent weeks. Movement by convoy, as is necessary in shipments to the Allies, has slowed up deliveries and has increased the number of tankers needed to maintain normal shipments.

Outstanding Developments

Exclusive of the war, there were oil developments of special interest in all parts of the country. In the following pages many of these developments are briefly summarized, with more details to be found in the International Section starting on Page 66.

Brazil

Last summer the Conselho Nacional de Petroleo, which is the petroleum-industry authority of Brazil and a department in the government, purchased three rotary drilling rigs—two to be delivered at the port of Sao Salvador, State of Bahia, and the third at Maceio, State of Alagoas. Both of these cities are on the Atlantic seaboard between Pernambuco (Recife) and Rio de Janeiro. Villa Militar No. 1, in the capital city of Bahia, was spudded in October 28 and Ponta Verde No. 1, at Maceio, on October 30. Lobato No. 2, also in Bahia, started drilling in November. At this writing these wells are drilling at about 3,500 ft., 3,100 ft., and 1,200 ft., respectively. They are being drilled with extreme care and cored most of the way.

Though several shallow holes have been drilled in the vicinity of these three locations, these are the first relatively deep tests. With seepages occurring in the region and showings of gas and oil in some of the shallow wells there is hope for the successful completion of one or more of these tests, though admittedly the structural position of the formations is somewhat in question. These wells may be considered as preliminary exploratory wells and designed primarily to obtain accurate knowledge of the subsurface formations for the benefit of future studies and locations. The entire operation is being directed and conducted by Drilling & Exploration Co., Inc., of Los Angeles, J. E. Brantly, president.

Amazon of Peru

Compania de Petroleo Ganso Azul, Limitada, completed the first producing oil well in the great Amazon Basin on its Aguas Calientes concession on the Rio Pachitea in eastern Peru in early March of 1939. The well made 100 bbl. per hour through the open tubing. Well No. 2 was drilled somewhat more than a mile to the northwest and on the northeast flank of the large anticline. Clean oil sands were found and tested, but later the well was drilled into water. Failing to get a water shutoff with a cement plug the well was filled with heavy mud and temporarily abandoned. Well No. 3 was drilled about ⅛ mile southeast of well No. 1 and a 250-bbl. well on ¼-in. choke was brought in.

The present plans of the company call for the drilling of three additional wells for the purpose of more fully proving the areal extent of the field and to supply crude to a small topping plant which the company contemplates building on the property to supply the local demand for petroleum products, principally kerosene. Equipment is now being moved from No. 3 to location No. 4.

The wells on the Aguas Calientes structure are approximately 1,200 ft. deep and encounter a maximum of 140 ft. of saturated sands and ashy sands above the water table. The drive is hydrostatic there being no gas whatsoever with the oil. The gravity of the oil is 46.5° A.P.I.

Eastern Venezuela

The outstanding developments in Venezuela, which, it is believed, passed the U.S.S.R. as the second largest oil-producing country the latter part of 1939, were in the eastern part. The completion of two pipe lines shown on the accompanying map furnished market outlets for new fields and will facilitate future developments in the entire eastern area.

The Mene Grande Oil Co. completed its 100-mile, 16-in. pipe line from Oficina to Puerto la Cruz in September, but a dispute between the company and government officials delayed use of the new shipping terminal until December 4.

Completion in November of a short pipe line from the Jusepin field, running northeast to Caripito, permitted routine production from that new eastern Venezuela area, which was first discovered in the latter part of 1938 by the Standard Oil Co. of Venezuela. A new refinery was completed at the Caripito terminal.

The producing wells drilled in the San Joaquin, Santa Ana, and El Roble areas in the State of Anzoategui, about 50 or 60 miles from the north coast of Venezuela, probably will be tied into the Oficina line early next year.

The Barco concession in the eastern part of Colombia started routine delivery of approximately 15,000 bbl. of oil per day through South American Gulf Oil Co.'s pipe line to the western coast at Covenas late in October. Colombia Petroleum Co., the operating unit jointly controlled by Socony-Vacuum Oil Co. and the Texas Co., is continuing its exploitation program in the Petrolea field, the Rio de Oro field, and is currently engaged in exploring other structural features existing between the two proven areas. The extensive exploration campaign

Left: Laying pipe line from Dammam to Ras Tanura, eastern Saudi Arabia. Operations of California Arabian Standard Oil Co. Lower left: Mexican drilling crew, Poza Rica field. Lower right: Freighting geophysical equipment across a river in Guarico, Venezuela. Right: Facade of Ministry of Fuel Building, Caracas, Venezuela, its modernity contrasting strangely with the view below it taken in the interior

carried on by subsidiaries of the Royal Dutch-Shell group, Socony-Vacuum, and the Texas Co. continued in the Magdalena River Valley.

Argentina

Largely through the efforts of the Yacimientos Petroliferos Fiscales, the government oil monopoly, Argentina production increased approximately 1,300,000 bbl. this year. The most important development in Argentina was discovery of the country's largest flush producer in the Tupungato area in the Province of Mendoza. Y.P.F. is planning vigorous exploitation of its other proven territories, particularly in the Comodoro Rivadavia field. The Y.P.F. opened bids late in December for the drilling of 75 to 100 wells in the Comodoro Rivadavia field, making a new departure in its activity.

Shell Oil Co. of Ecuador, Ltd., was organized early this year to explore the concession originally granted to the Anglo-Saxon Petroleum Co., Ltd., covering about 38,000 sq. miles on the northern and central part of the eastern slopes of Ecuador and extending to the Colombian frontier on the north. The company has established a complete personnel for carrying out aerial surveys, and geophysical and geological inspection at Zulay, on the eastern limit of the concession.

U.S.S.R. Activities

Exploitation activities in the U.S.S.R., concentrated in the Ural-Volga district, removed from frontiers of the country and consequently less vulnerable to invading forces, were of outstanding importance in the Soviet program. The main field in the Ural-Volga district is located at Ishimbayevo, where more than 200 wells have been drilled. Plans call for rapid development of the fields in this area, tripling or quadrupling production by the end of the third Piatiletka in 1942. The Ishimbayevo field is linked to the comparatively new refinery at Ufa by 91 miles of 10-inch pipe line, while remainder of the fields, mostly shallow and of comparatively small production, are dependent on rail and tank truck for movement of their output to refining centers. Plans were recently announced for a new refinery in the Soviet Union for construction in 1940. The plant site is reported to have been selected in the Nytvensk district, near the Krasnokamsk and Nytvensk production.

Soviet plans for the oil fields acquired in Poland have not been reported, but Germany lost little time in placing those in its portion on a routine producing basis, according to dispatches from Europe. The shallow areas around Jaslo, which fell into German territory, are thought to offer substantially better opportunity for increasing output by intensive exploitation and exploration than that accruing to the Soviets.

Persian Gulf

Interruptions of normal tanker movement during the final quarter of the year were largely responsible for the slight declines in production from Iran and Iraq. The European war also caused temporary delay of plans to increase the Iraq Pipe Line Co.'s capacity to Tripoli and Haifa, a project which was placed on the program for 1939 and 1940 early in the year.

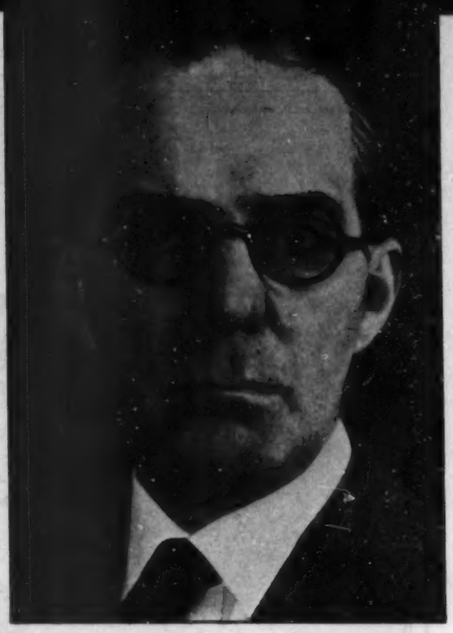
Construction of 165 miles of 12-in. pipe line to connect the new Gach Saran field in southern Iran with the Abadan refinery and erection of a new refinery at Bandar Shapur, east of Abadan, were projects under way before war was declared. Anglo-Iranian Oil Co., Ltd., has released no details since hostilities started, but it is understood that construction in Iran is going forward as rapidly as conditions will permit.

Among the important developments of the year in Asia was the steady increase of production in Saudi Arabia, where California-Arabian Standard Oil Co. is operating an extensive concession. Area of the concession held by California-Arabian Standard was increased during the year by approximately 89,000 sq. miles, raising the total to around 254,000 sq. miles. Production so far is confined to the Dammam field, which was linked with a deep-water shipping terminal at Ras Tanura by a 10-in. pipe line, nearly 50 miles in length. Eight wells have been drilled to the lower pay section between 4,500 and 4,700 ft., and three are producing a small amount of oil from the discovery pay at 2,100 ft.

Servants in front of geophysical camp on the Island of Celebes, Netherland East Indies

Five tests are drilling for the deeper pay in the Dammam field, and two wildcat tests were active at the end of the year. The No. 1 Abu Hadrya, about 100 miles north of the Dammam field, was last reported drilling around 8,400 ft. without having encountered production.

Bahrein Island production was off slightly from 1938, due largely to the fact that part of Bahrein Petroleum Co.'s refining capacity was engaged in processing Saudi Arabian crude. There were 62 producing wells on Bahrein Island at the end of the year and one test was drilling. An elaborate system of repressuring was set up in the Bahrein field during the year.



Ing. Ricardo Silveyra, president of Yacimientos Petroliferos Fiscales, Argentina

Italy

Crude-oil production from Albania, now part of Italy, more than doubled in 1939 due to the completion late last year of two hydrogenation plants at Leghorn and Bari, Italy, designed for the specific purpose of refining the heavy Albanian crude. Completion of facilities for utilizing the Albanian oil resulted in an expansion of drilling activity in the Devoli field, which contains about 420 producing wells, with an average daily output of approximately 2,500 bbl.

India

Completion of new refining facilities by Attock Oil Co. at Rawalpindi, in the Punjab district of India, enabled that company to enjoy more fully the benefits of its deep discovery in the Dhulian field, which now contains 9 or 10 completed wells.

International News photo

According to the German Propaganda Bureau, this picture was made by a German reconnaissance plane that flew over the Thames estuary, outside London. Numbered places are given by the German caption as follows: (1) "Tanks (oil) gleaming in the sunlight." (2 and 3) "Unloading stations for overseas oil." (4) "A tanker being unloaded"

The deep pay at Dhulian is found from 7,500 to 7,700 ft.

Indian Oil Concessions, Ltd., continued its exploration operations in new concession territory acquired last year covering the entire State of Bahawalpur, consisting of approximately 16,000 sq. miles within the Punjab and stretching for more than 300 miles along the left bank of the Sutlej, Punjnud, and Indus rivers. California-Texas Oil Co. has acquired an interest in Indian Oil Concessions and has contributed technical personnel in directing geophysical and geological work. Burma Oil Co. and associates are conducting exploratory work on two concessions in the State of Tripura and in the State of Khairpur.

Netherland East Indies

Extensive drilling activity was maintained this year in the proven fields of the Netherland East Indies, where stepout locations and deepening functions have combined to increase production for the year by approximately 7 per cent. Bataafsche Petroleum Maatschappij and Nederlandsche Koloniale Petroleum Maatschappij, subsidiaries of the Royal Dutch-Shell and Standard-Vacuum Oil Co., respectively, maintained their exploitation activities at a normal rate. B.P.M. was successful in increasing production substantially from its Limau field in the Palembang district, which was proven productive in the latter part of 1938.

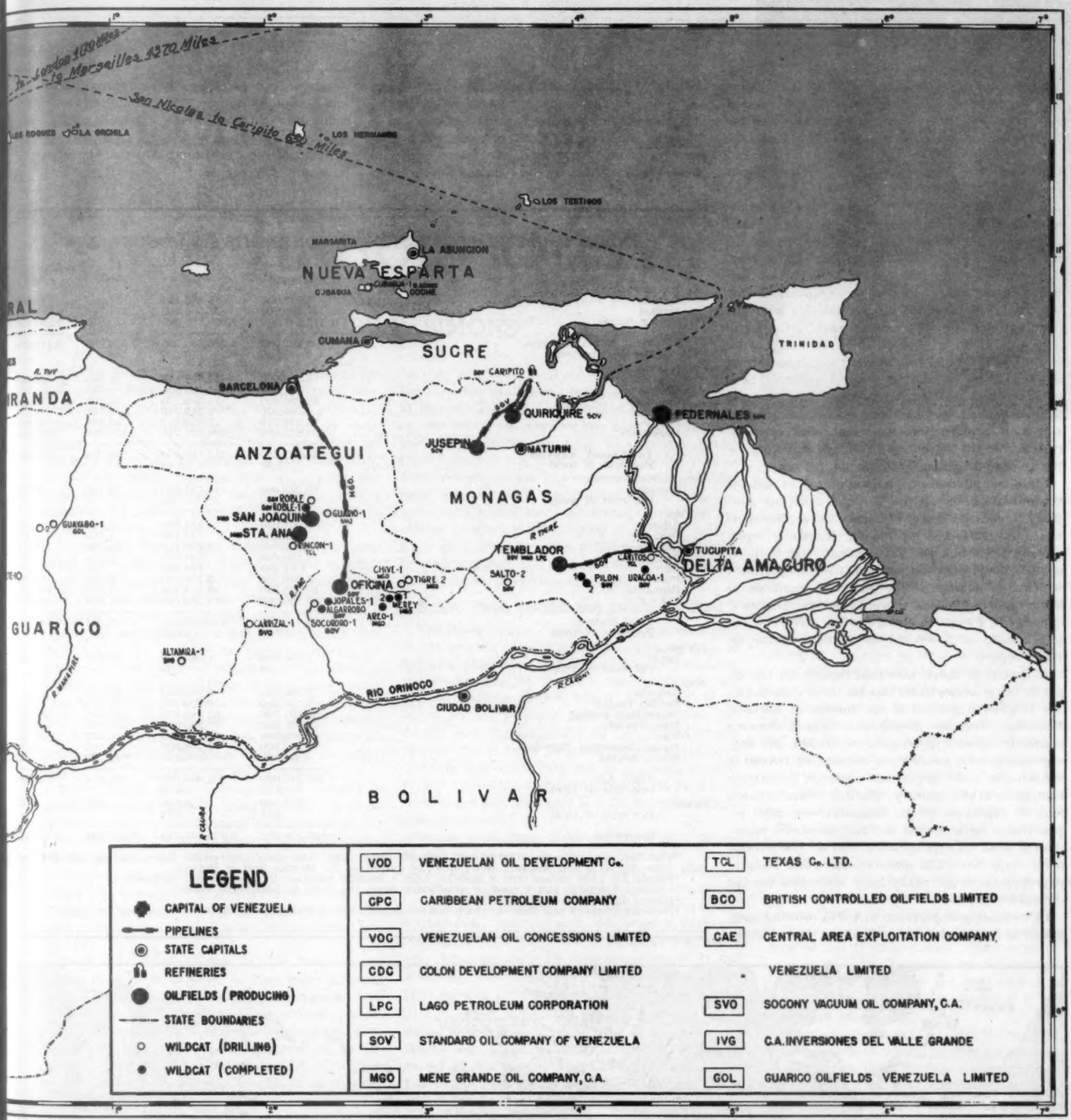
An 8-in. pipe line from Praboemoelih to Pladjoe, a distance of about 56 miles, was completed by B.P.M. to handle new production from the Limau field.

Probably the most important work of the year in the Netherland Indies was the drilling activity started by the Dutch New Guinea Petroleum Co. After drilling numerous shallow tests for geological information supporting air mapping, regional surface reconnaissance and geological and geophysical detail and semidetail, two deep wildcat tests were started.

Refinery Activity

The general dependence of Europe on the importation of finished petroleum products is strikingly reflected by the recapitulation of world refinery capacity and the detailed survey starting on Pages 75 and 78.

The 210 listed refineries in Europe, representing 22.65 per cent of the world's total number of plants, have only 17.77 per cent of the crude-oil capacity and 11.14 per cent of the cracking capacity. Most of the refineries and capacity are concentrated in France, Italy, Rumania, Soviet Russia, and the United Kingdom. Germany is shown to have 60 refineries, exclusive of those in the Polish territory which fell under Reich control with the conquest of Poland in August and September. Their capacity, however, is relatively unimportant when compared



LEGEND

- CAPITAL OF VENEZUELA
- PIPELINES
- STATE CAPITALS
- REFINERIES
- OILFIELDS (PRODUCING)
- STATE BOUNDARIES
- WILDCAT (DRILLING)
- WILDCAT (COMPLETED)

VOD	VENEZUELAN OIL DEVELOPMENT Co.	TCL	TEXAS Co. LTD.
CPC	CARIBBEAN PETROLEUM COMPANY	BCO	BRITISH CONTROLLED OILFIELDS LIMITED
VOC	VENEZUELAN OIL CONCESSIONS LIMITED	CAE	CENTRAL AREA EXPLOITATION COMPANY,
CDC	COLON DEVELOPMENT COMPANY LIMITED		VENEZUELA LIMITED
LPC	LAGO PETROLEUM CORPORATION	SVO	SOCONY VACUUM OIL COMPANY, C.A.
SOV	STANDARD OIL COMPANY OF VENEZUELA	IVG	C.A. INVERSIONES DEL VALLE GRANDE
MGO	MENE GRANDE OIL COMPANY, C.A.	GOL	GUARICO OILFIELDS VENEZUELA LIMITED

VENEZUELA SUMMARY OF PRODUCTION AND WELLS

	1938		1939*			Well data as of September 1, 1939								Wells completed Jan.-Aug. 1939
	Total production	Daily average	Total production	Daily average	Total to end of 1939*	Wells drilling	Natural flow	Gas/air lift	Pumping	Closed in	Inactive	Abandoned	Total wells drilled	
Ambrosio	1,210,546	3,317	949,000	2,600	27,573,962	0	2	0	77	2	29	15	125	0
La Rosa	16,778,660	45,969	15,695,000	43,000	298,716,075	0	114	30	474	70	222	53	963	3
Benitez	8,163,690	22,366	7,665,000	21,000	39,020,310	2	64	12	11	42	31	6	166	14
Tia Juana	43,699,954	119,726	49,640,000	136,000	119,897,442	0	193	5	221	21	10	1	451	15
Lagunillas	67,077,040	183,773	74,825,000	205,000	895,165,405	8	260	67	634	140	113	36	1,250	79
Bachaquero	986,799	2,703	3,504,000	9,600	4,565,580	0	18	0	1	10	12	2	43	8
Total lake fields	137,916,689	377,854	152,278,000	417,200	1,384,938,774	10	651	114	1,418	285	417	113	2,998	119
La Paz and Concepcion	1,822,521	4,993	1,423,500	3,900	26,400,992	1	2	0	81	19	30	5	137	2
Tarra and Los Manueles	5,236,872	14,348	5,584,500	15,300	56,136,642	2	17	0	49	10	31	14	121	8
Mene Grande	12,506,006	34,263	12,775,000	35,000	210,792,585	5	68	22	106	58	125	16	395	23
El Mene and Media	543,178	1,488	401,500	1,100	24,251,407	0	0	42	30	0	114	139	325	0
Cumarebo	2,596,801	7,115	2,664,500	7,300	24,519,586	0	45	2	10	29	17	13	116	4
Quiriquire	25,208,271	69,064	26,645,000	73,000	150,640,890	0	173	4	34	40	30	15	296	14
Pedernales	1,914,533	5,245	1,898,000	5,200	5,375,291	0	9	0	0	5	1	4	19	0
Temblador	2,305,089	6,315	3,650,000	10,000	6,032,072	2	54	0	0	12	9	14	89	28
Oficina	174,977	479	1,533,000	4,200	1,707,977	4	9	0	0	18	0	2	29	25
Jusepin	0	0	474,500	1,300	474,500	2	0	0	0	7	0	1	8	7
Others	247,430	678	547,500	1,500	4,307,115	7	8	0	4	39	14	111	176	9
Total Venezuela	190,472,367	521,842	209,875,000	575,000	1,895,577,831	33	1,036	184	1,732	522	788	447	4,709	239

*Partly estimated.

with the European total and much less significant as a factor in world affairs. It should be pointed out, however, that Germany contains facilities for the production of 10,000,000 to 12,500,000 bbl. of motor fuel annually by carbonization of coal and lignite and the eventual hydrogenation of liquid production derived therefrom.

In the strictest sense, the summary and the detailed refinery report present a slightly exaggerated picture of the current total refining capacity. In the detailed report it will be noticed that at least three large plants now under construction are included, but they will not become available for use until some time in 1940, or possibly later, depending upon the delays occasioned by the European war. The three outstanding instances of including plants under construction are those in Iran, Palestine, and Ireland. One small plant of 1,000 bbl. per day scheduled for construction in Peru is also included. The four plants, now in various stages of construction, represent total crude-oil capacity of 101,000 bbl. per day and cracking capacity of approximately 50,000 bbl. per day.

Since compilation of the detailed report and the recapitulation, one of the "Unirea" Societate Anonima Romanade Petrol (Phoenix Oil & Transport Co., Ltd.) refineries at Ploesti, Rumania, representing 15,000-bbl. per day capacity, has been reported temporarily or permanently incapacitated by fire. If damage to the plant was extreme, as some reports indicate, it would reduce "Unirea's" capacity at Ploesti to about 8,000 or 9,000 bbl. per day instead of 23,000 bbl. as credited in the detailed report.

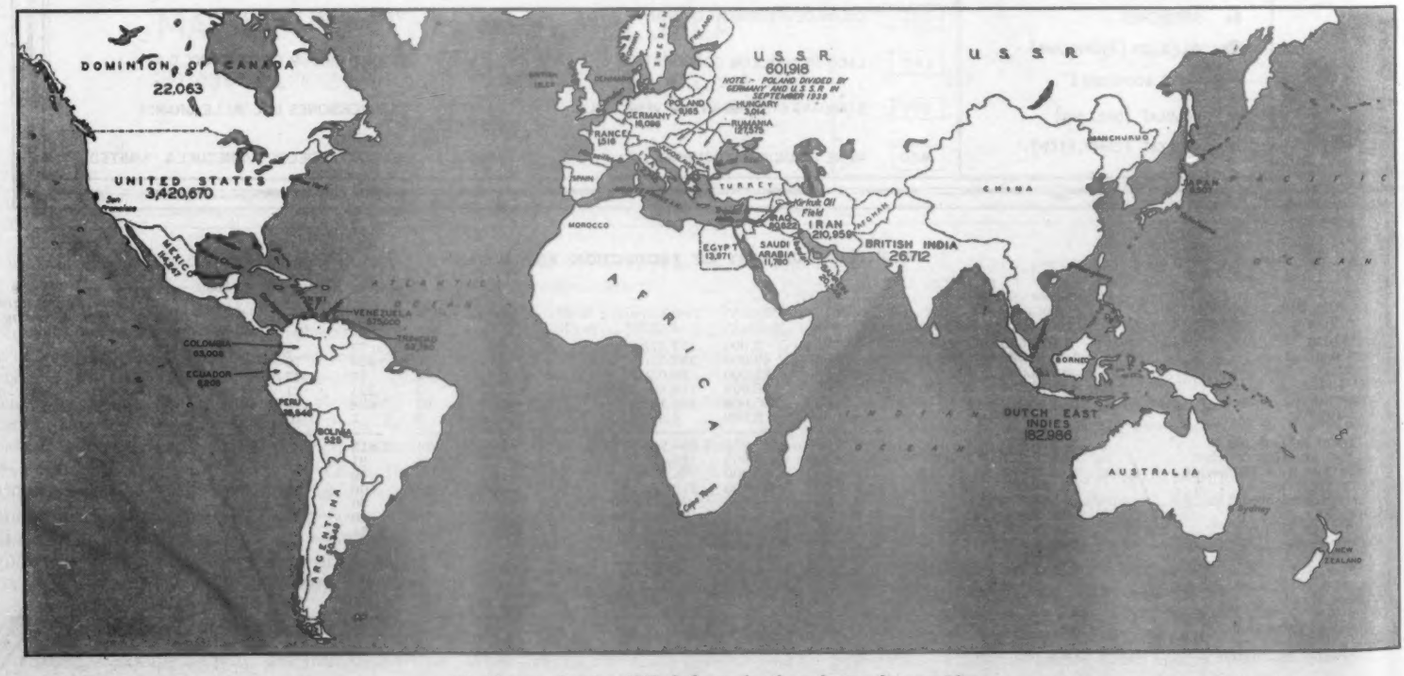
It should be noted also that figures on the capacity of refineries in Mexico are those supplied by the Petroleum Section of the Bureau of National Economy. The new government figures, showing crude-oil capacity of roughly 98,100 bbl. per day, are considerably lower than the total of 165,000 to 166,000 bbl. daily previously reported by private companies in that country. The downward revision may be explained by the comparatively small expenditures made by the private companies immediately prior to expropriation and by the government since in normal maintenance work. Natural deterioration could easily have accounted for the downward revision.

Of increasing importance in world refining operations is Asia, under which heading the refineries of Iran, the Netherland East Indies, and Japan are grouped. The crude-oil capacity of refineries in Asia, including the plants under construction in Palestine and Iran, is 686,200 bbl. per day, or 9.07 per cent of the world total. An interesting comparison is available between Asia and South America since both continents have approximately the same crude oil output. The correlation ends with crude, however, since South American plants have cracking capacity of 484,800 bbl. per day, or 13.25 per cent of the world total, while Asian refineries have only 7.66 per cent.

WORLD CRUDE-OIL PRODUCTION BY CONTINENTS AND COUNTRIES

Country—	1939 Estimated	1938	Daily average 1939	Daily average 1938
North America:				
Canada	8,053,000	6,956,230	22,063	19,058
Mexico	41,700,000	38,506,000	114,247	105,496
United States	1,248,544,000	1,200,883,000	3,420,670	3,290,000
Total North America	1,298,297,000	1,246,345,230	3,556,980	3,414,554
Per cent of total	62.87	62.97	.....	.....
South America:				
Argentina	18,377,500	17,077,600	50,349	46,788
Bolivia	191,600	135,400	525	371
Colombia	22,998,000	21,660,720	63,008	59,344
Ecuador	2,265,000	2,249,740	6,206	6,164
Peru	12,974,210	15,838,610	35,546	43,516
Venezuela	209,875,000	190,231,780	575,000	521,183
Total South America	266,681,310	247,193,850	730,634	677,366
Per cent of total	12.91	12.48	.....	.....
British West Indies:				
Trinidad	19,265,000	17,737,060	52,780	48,595
Per cent of total	.93	.89	.....	.....
Europe:				
Albania	921,650	437,600	2,525	1,199
France	553,230	532,180	1,516	1,458
Germany*	5,875,000	4,259,720	16,096	11,670
Hungary	1,100,000	324,850	3,014	890
Italy	91,250	106,100	223	291
Poland†	3,350,000	3,730,000	9,165	10,219
Rumania	46,565,000	48,984,200	127,575	134,203
U.S.S.R.‡	219,700,000	214,714,000	601,918	588,257
Total Europe	278,156,130	273,088,650	762,032	748,187
Per cent of total	13.47	13.79	.....	.....
Africa:				
Egypt	5,100,000	1,660,000	13,971	4,548
Per cent of total	.24	.08	.....	.....
Asia:				
Bahrein	7,500,000	8,298,000	20,548	22,734
British India§	9,750,000	9,829,700	26,712	26,931
Dutch East Indies¶	66,791,000	62,240,870	182,986	170,523
Iran (Persia)	77,000,000	77,230,000	210,959	211,589
Iraq	29,500,000	32,400,000	80,822	88,767
Japan (including Taiwan)	2,375,000	2,500,000	6,507	6,850
Saudi Arabia	4,300,000	495,150	11,780	1,357
Total Asia	197,216,000	192,993,720	540,314	528,751
Per cent of total	9.55	9.75	.....	.....
Others	355,000	250,000	970	685
Per cent of total	.017	.012	.....	.....
Grand total	2,065,070,440	1,979,268,510	5,657,681	5,422,650

*The German production figure now includes about 2,040 bbl. daily production from Austria and 330 bbl. daily from Slovakia and Moravia and 3 months' output of the Reich's part of Poland.
†Figure for 1939 covers only 9 months. Last 3 months included in U.S.S.R. and Germany.
‡Includes Sakhalin and 3 months' production from the U.S.S.R. portion of Poland.
§Burma included with British India.
¶Includes Sarawak and Brunei, which had combined total of 6,370,000 bbl. production during the year.



World map showing 1939 daily crude-oil production by countries

Recent Discoveries Keep Illinois Busy

By HARRY F. SIMONS

Oil fields in southern Illinois are working on a 24-hour per day schedule

DEVELOPMENT of new producing zones in existing fields and the discovery of several new pools during recent months, coupled with unusually good weather during the fall and early winter, has kept activity in Illinois practically at the summer level. In addition to the field work, two of the major pipe-line systems serving the state are being enlarged. The net effect of this work may be a peak production of 400,000 bbl. daily during 1940.

Anticipated bad ground conditions kept some work from starting, but continued fair weather encouraged operators to pursue drilling campaigns with the result being the opening of several new pools. It now appears that the Salem field will repeat its performance of last winter when that field was at its peak in development during severely adverse weather conditions. Considerable activity is also expected in Wabash and White counties. A scarcity of rainfall during the last few months has permitted easy moving of equipment, but Illinois operators know that rain, coupled with some freezing and thawing, will make the meeting of offset requirements very expensive.

Development of the Devonian lime horizon in fields producing from the Ste. Genevieve or Chester formations is now holding the attention of Illinois operators. Up to the present time four fields producing from the upper horizons have obtained Devonian production; two more fields are showing in the Devonian and the seventh pool (Louden, in Fayette County), had small Devonian production in the discovery well when it was drilled late in 1937.

Discovery of production in the Devonian at Salem came as no surprise as there were attempts to lease some of the producing properties for possibilities below the McClosky last summer. In addition, farmouts from major companies in practically all fields have been restricted to formations no lower than the Ste. Genevieve. The interest in Devonian production was given an impetus early in 1938 with the completion of the first Devonian well in the Sandoval pool although it was early in the summer before the possibilities of this formation on the western side of the basin were indicated.

Since then Devonian production has been uncovered in the Sorento pool in Bond County, the Bartelso pool in Clinton County and the Salem pool in Marion County. A well drilled to the Devonian on the southwest edge of the Centralia townsite pool flowed 40 bbl. per hour with the gun perforator lodged in the hole and a test in the Patoka field had saturation and was attempting to complete late last week. In addition Pure Oil Co. has announced it will make an attempt to obtain Devonian production by drilling a test well in the Cisne pool. Tex Harvey is drilling a Devonian test in the Tonti pool, and there is a possibility of other producing fields getting deep tests.

Salem Field Dominating Devonian Play

The Salem field is dominating the Devonian play at the present time with the second deep well in the pool completed last week. It is the Magnolia Petroleum Co.'s No. 28 W. B. Young, NE SW NE Section 20-2n-2e, which flowed 3,889 bbl. in 24 hours after a 1,000-gal. acid treatment. The discovery well, the Kingwood Oil Co.'s No. 18 Shanafelt "A," 614 ft. from the north line and 108 ft. from the east line of the NW NE of the same section, flowed 1,550 bbl. naturally through 2½-in. tubing in 17 hours and increased to 4,400 bbl. after a light acid treatment.

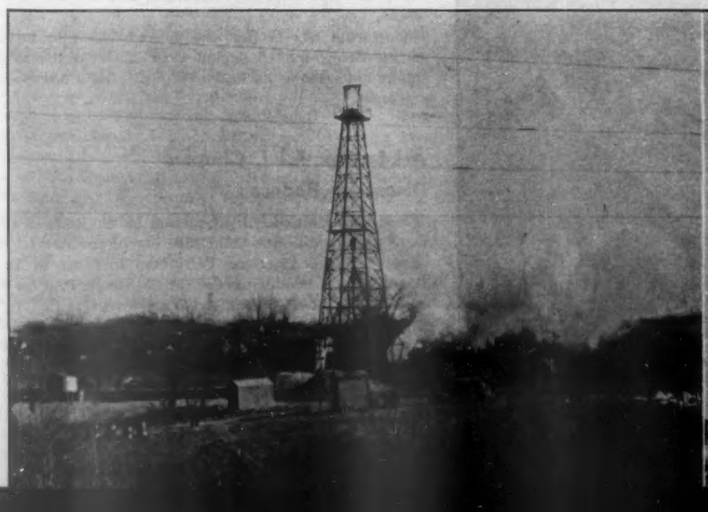
Better wells than either of these may be expected as the pool is further developed. In the Salem field, the pay section appears to be much thicker than it is in the Sandoval field to the north where the production came from approximately 6 ft. of pay. The best well completed at Sandoval had an initial of 4,675 bbl. in 24 hours with some water coming from the 3 ft. of pay zone. In the Kingwood Salem discovery the pay was scattered from 3,345 to 3,400 ft. with a total producing zone of about 24 ft. Magnolia Petroleum Co.'s No. 28 Young showed saturation from 3,372 to 3,407 ft., again indicating a thick pay zone.

Electrical logs of Devonian-producing wells have shown in most cases that the lower part of the pay horizon contains water. The Kingwood Shanafelt well drilled completely through the pay zone and then cased off the unproductive section. Complete correlation of the producing formation is lacking at this time as there is some confusion as to its exact stratigraphic location. According to L. E. Workman, geologist, Illinois Geologic Survey, the production may be coming from either the Lingle, Grand Tower or Dutch Creek formations. The Lingle is a fine-grained, slightly sandy lime and the Grand Tower is a very sandy lime, grading into pure sand containing water at the bottom. Heavy water production has been noted in the Sandoval field although Salem may escape much of this water trouble if the wells are not drilled too deep or produced too rapidly.

While no effort has been made to correlate the Illinois Devonian production with that of Michigan, both areas appear to have similar decline curves. Production curves on the Devonian wells in Illinois generally show a steeper slope than do those of the McClosky wells. Estimates of total recovery from the Devonian vary widely, ranging from 3,500 to 10,000 bbl. per acre with most production men and geologists crediting it with the average of those two figures.

There are several old Devonian fields in the state on which to base a total recovery figure, the Colmar-Plymouth field getting its production from that formation as does the Martinsville pool in southeastern Illinois. The best Devonian pool in the area is the Siosi pool in Vigo County, Indiana. This field is approximately 13 years old, has 750 proven acres and has produced approximately 2,600,000 bbl. to date. During 1938 the total production from this pool amounted to 150,000 bbl.

Below, left: Another townsite boom is in prospect for Illinois, due to the completion of the W. R. Curry's No. 1 Felix, NW NW SW Section 20-3s-8e, White County. The well, located just outside the limits of the village of Mill Shoals, flowed 200 bbl. from Aux Vases sand and extended the pool ½ mile. Right: Five pumping wells can be seen in this picture, taken in the north end of the Salem pool. The well drilling is a Devonian test, while the others are producing from the Benoist and Aux Vases sands and McClosky limes



Recovery per acre averaged 3,413 bbl. to the end of 1938.

The Prairie Creek field, also in Vigo County, is one of the newer fields in the area, having been discovered by the Carter Oil Co. late in 1937. The field produced approximately 150,000 bbl. during 1938 and to the end of June 1939 it had produced 264,451 bbl.; the daily average production was 390 bbl. during that month. There are approximately 600 productive acres on the structure. The Sandoval field in Marion County, Illinois, had 19 wells at the end of October, was producing a daily average of 6,129 bbl. and was credited with a total recovery of 531,273 bbl. of Devonian oil.

Magnolia Petroleum Co. has taken the lead in the development of the Devonian in Salem with 12 tests seeking that pay; the Texas Co., the largest lease owner in the pool has 5 Devonian tests, Kingwood Oil Co. has 4 and Shell Oil Co., Inc. has 3. Ohio Oil Co., W. C. McBride, Inc. and the Frontier Oil Co. each has 2 Devonian tests and Lad Oil Co., Haynes and Thomas, Paul Rossi and Mitchell Oil Co. each has 1 test. Some of these tests are nearing the completion stage and if more large wells are completed the drive for Devonian production will continue unabated during the winter.

Principal holdback in the development of the Devonian in Salem on a large scale has been the unwillingness of contractors to seek the work. Experience has shown that considerable drilling difficulties are present below the Ste. Genevieve and the contract rates prevailing for McClosky drilling have to be substantially increased to justify the risk. In some cases tests have been started without any contract being signed, the oil companies and contractors seeking a fair basis on which to arrive at the contract price. Due to the rapid production decline and the possibilities of drainage, oil companies are quite anxious to not allow offsets a great time advantage.

That an increase in the state's production is anticipated, and particularly an increase from the Salem field, is evident by the increase in pipe-line capacity through the looping of two of the more important systems in the state. The Illinois Pipeline Co. is looping its system from Martinsville, Ill., to Lima, Ohio, and is adding main-line stations; in addition this company is laying 7½ miles of 12-in. and 10 miles of 10-in. line from Sandoval to a point on the line west of the town of Vandalia and is also enlarging its facilities between Brownstown and Sorento. Texas-Empire Pipeline Co. is looping with 10-in. pipe its line from Salem to Heyworth which was put in service in September of this year and in addition is looping the 12-in. main line from Heyworth into Lockport, Ill. The increase in pipe-line capacity out of Salem will be approximately 60,000 bbl.

Pioneer of Unitization, Henry L. Doherty Dies

HENRY L. DOHERTY, 69, president of Cities Service Co., died in Temple University Hospital, Philadelphia, Pa., December 26. He had been in ill health for several years and succumbed to bronchial pneumonia.

He was born in Columbus, Ohio, May 15, 1870, and at 12 began work as an office boy for the Columbus Gas Co. where he advanced through various jobs until 1890. He next served as manager of public utility companies at Madison, Wis., St. Paul, San Antonio, Denver and 25 other cities until 1905 when he organized Henry L. Doherty & Co. serving as bankers and operators of public utility companies.

In 1916 his Empire Gas & Fuel Co. opened the Augusta and Eldorado fields in Butler County, Kansas, his first notable success in oil production. Ultimately his oil operations extended through the Mid-Continent area, and the Southwest, into Canada, Mexico, Argentina, and as a marketer in Europe and the Americas. His gas operations were nationwide, as were his light and power interests.

He was an early student of petroleum engineering principles and was a pioneer in the advocacy of unit operation, his insistence upon that policy frequently bringing him into heated conflict at meetings of the industry. So much so, that he was reported in later years to have observed if he wanted anything done it was only necessary for him to oppose it. He was an indomitable fighter for his ideas, many of which came to be accepted as valuable contributions to the oil industry. In 1938 the Petroleum Division of the American Institute of Mining and Metalurgical Engineers honored him with the Anthony F. Lucas Gold Medal "for distinguished achievement in improving the technique and practice in finding and producing petroleum."

He was awarded the first Beall Gold Medal by the American Gas Light Association in 1918 for his paper on "Gas for Fuel." He was the patentee of many combustion processes and apparatus. In 1930 the Franklin Institute awarded him the Walton Clark Medal "in consideration of his outstanding and valuable work in developing the manufactured gas industry."

Early this year the properties of the company were divided into groups comprising in each the oil, gas and public utilities. Each has operated under a management arrangement, the oil subsidiaries operating under Petroleum Advisers, Inc., and the gas properties under Gas Advisers, Inc. The individual oil and gas properties include Cities Service Oil Co. of Pennsylvania, Empire Gas & Fuel Co. and Arkansas Natural Gas Corp. Subsidiaries of these are numerous, some of the larger and better known include Arkansas Fuel Oil Co., American Pipe Line Co., Arkansas Pipe Line Co., Arkansas Louisiana Gas Co., Indian Territory Illuminating Oil Co., Texas-Empire Pipe Line Co., and Cities Service Asphalt Co. The foreign companies include Cities Service Oil Co. of Argentina, Dominion Natural Gas Corp., Tampico Texas Petroleum Corp., Compania Petrolera de Agwi, S. A., Mexican Atlas Petroleum Co., Compania de Terrenos Petroliferous "Imperio" S. A. and the Sabine Gordo Petroleum Corp.

HENRY L. DOHERTY

THE MARKETS*

CRUDE OIL: Production hit another peak in the past week with a total of 3,866,550 bbl. per day, an increase of 11,220 bbl. over the previous week's daily average. An increase of 17,808 bbl. in the daily production of Texas was more than sufficient to cause the total increase. Allowable production in January in the Mid-Continent states will be held close to the Bureau of Mines' estimate of demand for that month. In order to accomplish this in Texas, the Railroad Commission has ordered 13 shutdown days in the month: four Saturdays, four Sundays, and five Wednesdays.

REFINERY: Dull markets generally expected to continue till the opening of the new year, when moderate revival in some divisions is expected. Spurt in heavy-fuel prices on North Atlantic Coast is mainly result of high tanker rates. Descent of natural gasoline still unchecked. Light heating oils firmer and strong market in sight. Lubricants and wax holding their gains.

TANK WAGON AND POSTED DEALER: Dealer price of gasoline reduced 2 cents in Nashville, Tenn. Only minor changes otherwise, to effect local adjustments.

FINANCIAL: Oil shares did a little better than in preceding week, but market dull. Average of 30 representative stocks for week ended December 23: High, 26.40; low, 25.34; close, 26.03. Week ended December 16: High, 26.28; low, 25.19; close, 25.78.

*Detailed information in market section.

California Seeking Place On Cole Committee

NEW ORLEANS, La.—California, one of three states without oil-conservation laws, is seeking the vacancy on the Cole subcommittee, it was learned here.

Two of the present committeemen are from oil-producing states—Mr. Kelly, of Illinois, and Mr. Pearson, of Tennessee—and the other two—Chairman Cole, of Maryland, and Mr. Wolverton, of New Jersey—are not.

Rep. Clarence F. Lea, Democrat, of Santa Rosa, chairman of the House interstate and foreign commerce committe, who has the right to appoint himself to the vacancy, has been named first choice of the state, it was said. Second preference of the Californians was reported to be Rep. Carl Hinshaw, Republican, of Pasadena.

California has invited the subcommittee to inspect its oil fields, but Chairman Cole has said the group might not resume its hearings until after Congress reconvenes.

Ark-La-Tex A.P.I. Chapter Discusses Rodessa

Artificial methods of production in the Rodessa field were discussed at the third meeting of the Ark-La-Tex chapter of the American Petroleum Institute by B. J. Dowd, Union Producing Co.; F. E. Steele, Phillips Petroleum Co.; R. M. Sloan, Arkansas Fuel Gas Co.; T. H. Gibbs, Standard Oil Co., and W. B. Powers, Magnolia Petroleum Co. L. Mosley Moffitt, chairman of the chapter, presided.

No Further Pipe-Line Regulation Needed

By HENRY D. RALPH

WASHINGTON, D. C., Dec. 26.—A recommendation that the Interstate Commerce Commission take no steps to regulate crude-oil pipe-line rates and practices has been made to the commission by one of its examiners, J. Paul Kelley, in a proposed report in Investigation No. 26570. The recommendation has not yet been passed upon by the commission and an opportunity probably will be given for argument and the filing of briefs. The examiner's findings are significant in the light of the recent T.N.E.C. hearings on pipe lines and proposals in Congress to divorce pipe lines.

The investigation was started at the request of Secretary Ickes, then administrator of the N.R.A. petroleum code, when a number of pipe lines reduced their rates. Hearings were held July 23, 1935, and April 3, 1936.

Examiner Kelley's conclusion is that pipe lines are not common carriers but are operated as plant facilities and render no service to the general public, and therefore the commission need not concern itself with pipe-line rates and practices.

The examiner's report accepts as an established fact that pipe lines generally are controlled, either directly or indirectly, by integrated companies and are operated in their interest. An exception is the Northern Group of Pipe Lines, which has no affiliation with oil companies, but the examiner pointed out these lines depend upon shipments for integrated companies and their revenue is derived from shares of through rates published by connecting lines. Mr. Kelley stated that in practice crude oil is purchased in the field by representatives of large refining companies so that the producer has no market at the refinery and his marketing is completed before transportation of the oil begins, and therefore the refiner is, in fact, the shipper.

"Considering the whole record, it does not seem desirable or practicable for the commission to fix a minimum tender in this proceeding that would be applicable to all respondents. The pipe lines of the respondents are being operated primarily for the benefit of the large refiners and the flow of crude oil to the refineries is maintained in a manner which will best meet the requirements of the refiners. It may be assumed that if the present minimum tender requirements are found by respondents to require revision because of changed conditions in any particular, such revision will be accompanied by agreement between the interested parties."

He pointed out that conditions vary in different fields and that minimum tender must differ with the size of the trunk line and the gathering and storage facilities, but the chief objection to fixing a minimum tender he found to be the danger of contamination in moving relatively small quantities of different kinds of oil in successive batches.

Mr. Kelley concluded that earnings have been ample to repay cost of operation and allow for depreciation and the hazards of the industry. In fact, he stated most of the companies have paid dividends which have already equaled or exceeded the entire investment, but he found in this fact no justification for the commission to order reductions in the rates. He found that since 1933 there has been a general and progressive downward trend of pipe-line rates which shows evidence of continuing, and concluded that most of the rates have already reached, or will soon reach, a level approximating or lower than 65 per cent of the rates in effect December 31, 1933, the level recommended in the first proposed report. He added that these rate reductions may have been caused by tax laws and accounting practices of integrated companies.

No shippers or potential shippers of crude oil appeared at the hearings, and he said the reason for this is clearly that the pipe lines are being operated as plant facilities of the large refiners, and, although under the law they are common carriers, they are not being operated as common carriers in fact. He said there is no evidence that any individual rate is unreasonable, and neither is there evidence justifying the commission in making a horizontal reduction in all pipe-line rates.

In concluding, Examiner Kelley said:

"When a shipper pays as transportation charges the legally published rates of its subsidiary pipe-line company, or those of a pipe line which is merely a department of the parent company not separately incorporated, by what measure is the reasonableness of that rate to be determined, and under what circumstances would such a rate become unjustly discriminatory or unduly prejudicial? The same questions are presented where the transportation is performed by a series of pipe lines having an affiliation of interests. From this record, the only evidence as to the effect of the rates charged by the respondents is a showing of enormously high earnings in the past. The record amply demonstrates that those earnings have diminished perceptibly during the period of this investigation and the evidence points to further curtailment of earnings in the future.

"There is a public interest which demands that common carriers shall not receive for the use of the facilities devoted by them to the public service more than that service is worth to the public. But the public does not use the pipe lines of respondents, except in so far as the oil companies for whose benefit the lines are operated constitute a part of the public, and there is no assurance that a flat reduction in rates, even to a level which would show only a minimum of earnings that would escape confiscation, would result in benefit to the public beyond that portion of the public now being benefited by the use of the pipe lines of these respondents."

DEATHS

A. C. FELT, 69, secretary-treasurer of William Penn Petroleum Co., Tulsa, died December 22.

FRANK S. DUGA, 62, Tulsa oil man, died December 24 in Tulsa. He moved from East Liverpool, Ohio, in 1920.

JOSEPH A. DUNN, division manager of National Supply Corp., at Los Angeles, Calif., died of heart attack December 15.

CARLTON SMITH YERKS, 82, at various times driller, oil operator and nitroglycerin manufacturer, died at Petrolia, Ont., recently.

ARIAN R. (Ike) SIMONS, 73, Tulsa oil producer, died December 26. He had been active in the oil business in Oklahoma since arriving in the state over 25 years ago from Bradford, Pa.

GEORGE L. PEYTON, 55, Mexia, Tex., oil man, died December 26. With his brother he owned Peyton Brothers Oil Co. which held producing properties in Polk, Gregg and Wharton counties.

HUGH KELSEA MOORE, 67, former gold medalist of the American Institute of Chemical Engineers and president of the organization in 1925-26, died December 18 at Dunedin, Fla. He had written many scientific chemical books and was interested in the early process for continuous hydrogenation of oil.

Chicago Gas Rate Hearing To Resume January 8

WASHINGTON, D. C.—The Federal Power Commission has ordered the hearing on rates of the Natural Gas Pipe Line Co. of America and Texoma Natural Gas Co. to be resumed here January 8 before Examiner Ewing G. Simpson.

The companies serve the Chicago area. The hearing has been conducted since May in Chicago and Washington before the examiner, and was adjourned in Chicago December 14.

At the next session counsel for the companies will crossexamine Charles W. Knapp, Jr., on the staff of the Power Commission, and present rebuttal to evidence which was given for the Illinois Commerce Commission and the federal commission.

The full commission, after hearings concluded here on a petition for an immediate reduction of the rates, ordered counsel for the companies to file briefs within 20 days. The attorneys protested this time was too short, and the commission vacated the order.

The commission directed instead that 5 days after completion of the crossexamination and presentation of rebuttal evidence beginning January 8, counsel for the Illinois commission and the Federal Power Commission must have their briefs in; counsel for the companies must file their briefs within 20 days after completions of the hearing.

The Illinois Commerce Commission had asked the Federal Power Commission for an immediate rate reduction of $3,500,000 on natural gas sold to distributors in the Chicago area. The company's attorney, S. A. L. Morgan, countered by denying that the commission had jurisdiction over the rates. He contended they were fixed by contract between the companies and wholesale customers and were not public rates subject to jurisdiction.

Settlement of Gyro Suit Against Pure and Texas Co.

DETROIT, Mich., Dec. 23.—The suit brought by Gyro Process Co. over 2 years ago against Pure Oil Co., Texas Co. and others, as well as the suits filed by Chemical Research Corp. (a majority stockholder in Gyro) against the same companies during the last 6 months, have been settled. Claims were made that Gyro should be given title to patents held by Pure covering processes for polymerizing gases, for clay treating distillates and for preventing gum formation in gasoline.

Agreements were entered by which Gyro will be able to license its vapor-phase cracking process somewhat more advantageously than heretofore and will be able to license the Pure's polymerization process for the treatment of Gyro gas. All claims made by Gyro and Chemical to ownership in Pure's polymerization, clay-treating and gasoline antioxidant patents were dropped and orders have been entered dismissing the suits with prejudice. Pure is now free to proceed with development of these patent assets.

The settlement also involved a cross licensing arrangement between Gyro and Gasoline Products Co. whereby Gyro can offer its licensees protection under patents of Gasoline Products Co.

New Gasoline Plant for Northeast Coalinga

LOS ANGELES, Calif.—Construction of a gasoline-extracting plant near Coalinga with a capacity of 20,000,000 cu. ft. daily was announced by Standard Oil Co. of California. The plant will cost approximately $275,000. The company states that the new plant is required because of the increase of gas production at Northeast Coalinga and the prospects of increased production in that area. The gas will be transported from the Coalinga-Amerada area by means of a booster plant and pipe line.

STATE CAPITALS

TEXAS

ADDITION OF FIVE WEDNESDAY shutdown days in the January proration order issued by the Railroad Commission last week will serve to remove the violent fluctuations in weekly production that in recent months have characterized Texas' production. By including five Wednesdays in the production holidays, in addition to eight Saturdays and Sundays, Texas oil fields will be held to a figure of about 34,000 bbl. daily under the Bureau of Mines estimated market demand set for Texas during January. Thus weekly production will be kept on a more even keel. In recent months, weekly production has either exceeded or was below the bureau's figure, depending on the number of shutdown days included in the week.

The 13 production holidays will allow Texas fields to be produced only 18 days during January, a fact which is causing some concern among Texas producers. When shutdowns were first adopted by the commission as a means of holding production within bounds, only one or two shutdown days a week were necessary. As the basic daily allowable continued to increase at a rate faster than the state's allocation, additional days were added; for a while 9 or 10 days were adequate, but last months 12 days were required. When the year of 1939 closes, Texas' fields will have been shut in a total of 113 days during the year, or an average of almost 9.5 days a month.

In announcing the new order, Chairman Lon A. Smith stated: "The commission regrets a continuation of the shutdown program during January. It is necessary, however, that we continue shutdowns in that month. The engineering department already is preparing schedules which we hope will enable us to carry on in February and throughout the year without any shutdowns. The commission has endeavored to stay within the allowable set by the bureau. It takes an extra day to keep our production within the bureau's estimate for January. If conditions warrant during the month, we can take off any day or days that the demand might justify."

The basic allowable for January 1 totaled 2,217,496 bbl. daily, an increase of 76,055 bbl. over that on December 1. Only minor changes were made in the January 1 order from the allowable of December 15, which totaled 2,215,758 bbl. with 211,615 bbl. of exemptions. Under the order Texas will start 1940 with an estimated daily average net allowable of 1,376,320 bbl., as compared with an average of 1,319,542 bbl. daily at the start of 1939.

Basic allowables as of January 1 and December 16, and exemptions as of December 16, by districts are as follows:

	Basic allowable		Exemp.
	Jan. 1	Dec. 16	Dec. 16
Southwest Texas	370,915	370,729	21,607
Gulf Coast	334,715	334,816	80,676
East Central	128,253	128,253	38,338
East Texas	690,000	690,000	.....
West Central	69,560	69,557	12,803
West Texas	336,879	336,879	40,987
North Texas	153,193	152,089	17,204
Panhandle	133,981	133,435	.....
Total	2,217,496	2,115,758	211,615

Three principal changes were made in the list of fields exempt from the shutdowns, consisting of the exemptions granted the Sulphur Bluff field of Hopkins County and the Midway field of San Patricio County being eliminated. Third change was that in the Mission River field of Refugio County, the general exemption was modified to include only those wells with excessive water conditions and to exclude recent completions which are not having any water difficulties.

Principal increases granted fields over their December 1 allowables included: In Southwest Texas—New Refugio, 1,584 to 6,943 bbl.; Aransas, 4,081 to 18,125 bbl.; and Flour Bluff, 2,238 to 7,180 bbl. In Gulf Coast fields Amelia was raised from 1,328 to 4,752 bbl. daily; Raccoon Bend (Cockfield), 1,042 to 3,430 bbl.; Sugarland from 6,007 to 10,601 bbl.; and Webster raised from 6,055 to 16,364 bbl. In West Texas the Foster field's basic allowable was boosted 2,784 bbl. to a total of 17,265 bbl. daily. Wasson field, of Gaines and Yoakum counties, was given an allowable 3,164 bbl. higher than the former separately carried Wasson and Bennett areas.

AMONG ORDERS ISSUED by the Railroad Commission last week, one involved amendments to Division 1 of state-wide Rules 9, 10, and 11 of Oil and Gas Circular 16-B. These admendments will serve to simplify procedure, as filing of notices of intention to drill, deepen, or plug after January 1 will be required only in the district offices of the commission instead of both in the district and Austin offices. The same provision was also provided for filing of log and well records.

ILLINOIS

JOHN PUGH, president of the Independent Oil Producers Association of Illinois, says that during the past few weeks a remarkable swing in both public and industry sentiment favoring conservation legislation has taken place in Illinois. "Favorable editorial comment from newspapers over the state, support from chambers of commerce and civic clubs, from state leaders and outstanding farmers and business men has been increasing steadily," said Mr. Pugh, "and in addition to these most hopeful signs we now have the support of representatives of more than 80 per cent of the oil being produced in Illinois. So, I believe, I can safely say that the prospects for more orderly production methods and early stabilization of the industry in Illinois are stronger than at any time since oil development began in the 'basin.' Such a program would mean elimination of most of the present physical and economic waste and the establishment of the industry on a firm basis of continuing prosperity in 1940, and years to follow. The measure of this improvement will be determined by the support the people give to impending oil-conservation legislation through their state officials."

LOUISIANA

AN INCREASE OF 12,992 BBL. DAILY output of oil in Louisiana for January was announced in the official proration order issued by Ernest S. Clements, conservation commissioner, and D. B. McConnell, director of the Minerals Division of the department.

The Louisiana Conservation Department set the daily allowable for January at 268,192 bbl., an increase of 12,992 bbl. over December.

The allowable for South Louisiana was 250,967 bbl. daily and for North Louisiana fields 62,225 bbl. daily.

About 1,100 bbl. of the increase was assigned to new wells, the department records showed.

ARKANSAS

ALLOWABLE PRODUCTION in Arkansas in January was set at 70,000 bbl. per day, or 558 bbl. per day in excess of the Bureau of Mines estimate of demand from that state. The controlled fields will be allowed 41,802 bbl. per day by the Conservation Commission's order, and the unprorated settled fields 28,198 bbl. per day. The controlled fields and their allowable are Atlanta, 600 bbl.; Buckner, 2,405 bbl.; Dorcheat, 300 bbl.; Magnolia, 19,214 bbl.; Schuler (sand), 14,997 bbl.; Schuler (lime), 2,801 bbl.; Village, 1,485 bbl.

OKLAHOMA

OKLAHOMA CORPORATION COMMISSION fixed the January crude-oil production allowable at 433,900 bbl. daily, a reduction of 3,700 bbl. from December, but the same as estimated for demand by the Bureau of Mines.

Only minor changes were made in the pool allocations. The Shawnee pool was increased 300 bbl. to 1,500 bbl. daily; Butcher field was increased 350 to 650 bbl. daily and Hobart pool was increased from 500 to 800 bbl. daily.

These adjustments, plus the total cut, brought the unprorated areas to a total of 152,010 bbl., off 4,650 bbl. daily. This group was underproduced in the November period.

Due to new potentials, percentage flows will be increased in a number of pools next month.

Oklahoma operators overproduced the state's allowable 4,910 bbl. daily, for an average output of 433,910 bbl., during November.

Percentage flow in January was increased in virtually all of the Class A, B, and C fields because of new potentials, the net increase averaging about 5 per cent over December.

The new Burton field, in southwestern Seminole County, was transferred from Class C to Class B and given an allowable of 1,500 bbl. daily. This area, now about a year old, has been having trouble getting an outlet, but a guaranteed market has been established.

Shawnee pool was increased 300 bbl. to 1,500 bbl. daily to permit raising the per-well allowable. There are about 40 wells in the field.

A new zone was created in the Doyle field of Stephens County, to be known as the Dees, and allowable was fixed at 100 bbl. daily. This deeper zone was discovered by Helmerich & Payne's No. 1 Hefner, an old producer deepened. A second well is drilling.

The new Butcher pool, southeast of Shawnee, was increased from 300 to 650 bbl. daily because of addition of new wells, two now being tested and another due to test within a week. The Coyle field in Payne County was increased 400 bbl. to 2,400 bbl. because of the new wells.

With a new market established, the Hobart field of Kiowa County was boosted from 500 to 800 bbl. daily in January. Crude is being purchased by the Peppers Gasoline Co. and Black Gold Refining Co., both of Oklahoma City. These purchasers also are to take all underproduction from the four wells.

The Atlantic Refining Co. and others' unitized area northeast of Shawnee was brought under proration with a field allowance of 250 bbl. daily.

In making adjustments, the commission reduced by 3,700 bbl. the allocation to the unprorated areas, fixing the top at 151,210 bbls. daily.

BY AGREEMENT OF ATTORNEYS the Corporation Commission Thursday postponed hearing until January the petition of the Magnolia Petroleum, Ohio Oil, and Ramsey Petroleum companies for 10-acre well spacing in the Rowe-sand zone of the Cement field of Caddo County.

In the meantime, a survey is being made of the field to determine its number of producing zones, rate of production, etc. Opposition to the petition will be voiced by independent operators on the townsite and citizens of Cement.

CALIFORNIA

CENTRAL COMMITTEE of California Oil Producers has fixed the crude-oil allowable for January 1940 at not to exceed 599,000 bbl. per day, and upon recommendation of the allocation subcommittee reduced the top peak allowable for wells in the top brackets from 204 bbl., which prevailed during December, to 195 bbl. daily in January. This reduction affects 712 wells, which comprise the largest and deepest wells in the state, and reduces production about 6,600 bbl. daily. Under ordinary conditions it would be customary to reduce production during the winter period, but this year this will probably not be necessary, as it is expected that liftings of California oil for Japenese buyers will be large, since the commercial trade treaty expires on January 26, 1940.

the OIL AND GAS JOURNAL

PRODUCING REFINING NATURAL GASOLINE PIPE LINE

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The World's Record

Within the year which ends Sunday the world oil industry has produced 2,065,000,000 bbl. of crude oil, establishing a new record.

This tremendous production, practically all of which was consumed during the year, represents a 100 per cent gain in the last 15 years, and is four times the output of a little over two decades ago.

In contrast to most industries which still have to look back to 1929 for their peak production and sales, the world oil industry's output this year is nearly 40 per cent greater than it was in that boom year of modern times.

Possibly the significance of this immense production of raw material can be visualized better when it is realized that this year's output, if transported in the 8,000-gal. tank cars of the American railroads, would make a train 78,000 miles long which would encircle the earth at the equator more than three times.

Those outside the oil business have frequently expressed amazement at the industry's ability to continue the expansion of its operations in bad times as well as good times on a worldwide basis.

Essentially it reflects man's efforts to increase his producing capacity and thus improve his standard of living, including the enjoyment of those things which have become necessities to a large part of the population.

War accounts for a small part of the total petroleum demand. So far as being an outlet for petroleum, the present war is more a liability than an asset because it obstructs at least temporarily the normal progress of mankind which through the years has accounted for the great bulk of petroleum consumption.

Every nation which had started out on a program of improving its national economy has been concerned immediately with the problem of cheap and convenient power. Output cannot be increased in field or factory or in transportation until mechanical power can be obtained at reasonable cost.

The internal-combustion engine in many forms and applications, fueled by petroleum, has been the answer for a large part of the world. Totalitarian and democratic nations alike have found that their people could not strengthen their economic positions until they were given this tool made possible by petroleum.

In the controlled economy of the U.S.S.R. the tractor has revolutionized agricultural pursuits. In South America and many other points automotive and stationary power has made it possible to produce raw materials and products in areas which were inaccessible a few years ago. The automobile, the tractor, the truck and the airplane are found on every frontier.

Kerosene for lighting is still being introduced in many parts of the world. On the high seas the markets for diesel fuel and heavy fuel for the generation of steam power are constantly expanding.

But these essentially practical uses of petroleum are, of course, only part of the picture. In many countries the automobile has become a necessary part of family living, as it has been in this country for several years.

The highways of the entire world have been improved and lengthened because man has found that transportation by car is the more convenient and enjoyable method of travel. The car has become a necessity.

The immediate possibilities are apparent in the development in this country where the petroleum consumption per capita is now approximately 10 bbl. a year. The average requirement of the rest of the world is only a small fraction of this average in the United States.

It is useless to talk about the saturation point for an industry the demand for whose products is just getting well under way over a large part of the world.

1940 - A FORECAST

Next year's demand will exceed that of any year in history; Volume of export movement depends on war developments

OPERATORS in the United States in 1940 will be called upon to produce and refine more crude oil than during any previous year in the history of the industry. Domestic and export markets will require 635,000,000 bbl. of gasoline, and domestic producers will be called upon for 1,330,000,000 bbl. of crude oil.

This year, in response to an increase of nearly 5 per cent in total gasoline demand and gains in other products ranging up to 15.5 per cent, refiners ran more crude oil to their stills than ever before, the increase over 1938 being about 6 per cent.

In supplying most of this demand for finished products, oil fields in this country, according to preliminary estimates, produced 1,248,544,000 bbl., or about 48,000,000 bbl. over the previous year, and operators withdrew approximately 35,000,000 bbl. from their inventories. This indicates demand for crude oil was greater than in any previous year, but the actual production was slightly less than in the peak year of 1937.

The 1939 gain in gasoline was greater than expected at the start of the year, reflecting a sharp rise in production of motor vehicles plus improved business condition which increased consumption per car. The total gain was entirely due to higher domestic demand, gasoline exports being about 8 per cent less than in 1938. Preliminary estimates indicate that the domestic consumption of gasoline this year totaled 554,000,000 bbl., an increase of 31,000,000 bbl., or 6 per cent, over 1938. Exports decreased from 50,109,000 bbl. in 1938 to 46,000,000 bbl. this year.

Car Sales

Retail sales of motor vehicles in the United States totaled 3,250,000 this year, a gain of almost 40 per cent over 1938, which was the lowest production year since 1933. The new-car sales exceeded the junking of old cars by a substantial margin, and the Automobile Manufacturers Association estimates that the 1939 car registration in the United States will total 30,710,000, an increase from the 29,485,680 reported for the end of 1938.

This means in effect there will be more motor vehicles on the streets and highways on January 1, 1940, than at the start of any previous year. In this forecast covering 1940 gasoline requirements it is estimated that retail sales of motor vehicles will be 10 per cent greater than in 1939, making a total of 3,575,000 units. This is less than the predictions of car manufacturers and less than the base figure that has been used by some economists, both within and outside the oil industry, in making their gasoline projections for 1940.

Assuming this sale of 3,575,000 new units in 1940, it is predicted that domestic gasoline sales will total 589,000,000 bbl. next year. This represents a gain of 6.3 per cent over the year now closing. The justification for predicting this exceptionally large increase in domestic demand next year rests not only in the expectation that the number of motor vehicles will increase but also that the trend toward higher consumption per unit will continue.

The gains in gasoline consumption in this country over the past 10 years have been due more to increased consumption per car than the increased number of cars. This is indicated in the fact that while the domestic gasoline consumption in 1940 will be more than 50 per cent greater than in 1929, the increase in motor-vehicle registration over 1929 will be less than 20 per cent. Car manufacturers in this country have never been able to equal the more than 5 million cars produced in 1929, but, nevertheless, since that time, with the exception of one year, the trend in gasoline consumption has been steadily upward.

Gasoline exports for 1940 are left at the same level as in 1939. Due to the uncertainties created by the war, there is little basis at this time on which to project export-gasoline purchases. Since the war started on September 1, gasoline exports from this country have been running behind the oversea shipments of the summer months. This development is explained as a reflection of rationing of civilian consumption by the nations at war and several other European neutral countries, coupled with the fact that the war needs have been kept at a minimum by the inactivity on most of the war fronts. There is the additional fact that shipping facilities have not been normal and the Allies presumably have been drawing on their storage to supplement current deliveries.

As long as these several situations continue there will be little change in the gasoline movement from this country. It is believed that the shipments will not go below present levels, and there are predictions that the export demand will expand after the first of the year. Economists of the industry have pointed out that as long as the war continues there always will be the possibility that the gasoline demands from this country will be suddenly increased by expansion of war activities or the stoppage of other sources of supply.

It is not expected that the demand for products other than gasoline in 1940 will show the large increase recorded for 1939 over 1938. Assuming a continuance of business conditions at slightly higher average levels than in 1939 there is every reason to believe that the total demand for these products will show at least small gains next year.

The trend in kerosene demand in this country has been upward for several years. This is a reflection of new uses and greater requirements from many of the older outlets. The consumption of kerosene and the lighter distillates has greatly expanded in recent years due to their use as tractor fuel and for heating. There has been a strong export demand for both products since the start of the war. The number of oil burners using furnace oils has increased in recent years and the consumption of several grades of distillates and gas oil as diesel fuels is increasing rapidly. These developments account for the large gains reported over the past 3 years for products classed as distillates and gas oils. There is no apparent reason at this time why this trend should change in 1940.

After a bad slump in 1938 and early 1939, the consumption of heavy fuel oils increased rapidly the latter part of this year. The demand for this product follows general business trends fairly closely, and the slump in 1938 and the recovery this year were in line with this usual relationship. Most of the heavy fuel oil is consumed by industry, the marine trade, and the utilities. The demand for fuel was particularly strong during the fall months owing to the recovery in several lines of industry, particularly steel. It is believed that the average level of activity of those industries and utilities consuming fuel oil will be greater in 1940 than in 1939.

1940 DEMAND—GASOLINE AND DOMESTIC CRUDE OIL

	1940	1939	1938
Gasoline	635,000,000	600,000,000	573,112,000
Daily average	1,739,000	1,643,800	1,570,000
Domestic crude oil	1,330,000,000	1,248,544,000	1,200,883,399
Daily average	3,643,800	3,420,600	3,290,000

Data in barrels. November and December 1939 estimated.

1939-1938 SUPPLY AND DEMAND

	†1939	1938
Supply		
Domestic crude-oil production	1,248,544,000	1,200,883,000
Natural gasoline	49,500,000	51,347,000
Benzol	2,400,000	1,769,000
Total production	1,300,444,000	1,253,999,000
Imports:		
Crude oil	35,000,000	26,412,000
Refinery products	31,500,000	27,896,000
Total imports	66,500,000	54,308,000
Total supply for all oils	1,366,944,000	1,308,307,000
Daily average	3,745,000	3,584,000
Demand		
Domestic demand*	1,232,500,000	1,137,123,000
Exports:		
Crude oil	71,500,000	77,254,000
Refinery products	121,000,000	116,474,000
Total demand for all oils	1,425,000,000	1,330,851,000

*Includes still gases, miscellaneous oils and losses from operation. †November and December 1939 estimated.

Demand for Refinery

Product—	Total demand* 1939	Total demand* 1938	1939 increase per cent
Gasoline	600,000,000	573,112,000	4.7
Kerosene	70,000,000	63,864,000	9.6
Gas oil and distillate	170,000,000	147,090,000	15.5
Fuel oil	341,500,000	309,753,000	10.2
Lubricants	36,000,000	30,650,000	17.4
Wax (lb.)	522,000,000	479,979,000	8.7

*Wax demand plus exports. All data in barrels.

Aviation Fuel on Moral Embargo List

WASHINGTON, D. C., Dec. 26.—The administration's "moral embargo" against the exportation of military supplies has been extended to equipment for the manufacture of aviation gasoline.

The State Department has announced that American oil companies have been asked not to deliver equipment or plans to nations which bomb civilian populations from the air, which means Japan and Russia. For 2 years there has been a moral embargo on the sale of military aircraft to Japan, and American airplane manufacturers have complied with the Government's request for a voluntary embargo. Since the Russian invasion of Finland, this embargo has been extended to Russia, and last week manufacturers of aluminum and molybdenum, two metals essential in airplane manufacture, were asked to refrain from accepting orders for export to Russia and Japan. The State Department's announcement on aviation-gasoline equipment reads as follows:

"The department, after consultation with the War and Navy Departments, has decided that the national interest suggests that for the time being there should be no further delivery to certain countries of plans, plants, manufacturing rights, or technical information required for the production of high-quality aviation gasoline.

"This decision has been reached with a view to conserving in this country certain technical information of strategic importance and as an extension of the announced policy of this Government in regard to the sale of airplanes, aeronautical equipment, and materials essential to airplane manufacture to countries the armed forces of which are engaged in unprovoked bombing or machine-gunning of civilian populations from the air.

"The interested American oil companies have been informed of the Government's decision in this matter."

This embargo has nothing to do with the neutrality law and is not legally enforceable, but there is every expectation owners of refining patents and manufacturers of equipment will comply.

It was explained orally at the State Department that aviation gasoline itself is not included in the embargo, because if a nation does not have airplanes equipped to burn high-grade gasoline there is no necessity to embargo exports of gasoline to it; but informed government officials are of opinion that this announcement is in the nature of a hint; and if sizeable exports of aviation gasoline to Japan and Russia are noted, the moral embargo will be extended to it. The State Department did not reveal whether it has information that Russian and Japanese interests have been negotiating for the purchase of American equipment to produce aviation gasoline. There have been reports of exports of aviation gasoline from California, both to Japan and Russia, in recent months; but as far as official statistics show, these shipments have not been of the high-octane aviation gasoline used in this country, but have been of a type which might be used either for aircraft or other purposes.

At the same time, the Bureau of Mines released the first of a series of monthly reports on production, stocks, and shipments of aviation gasoline, covering the month of October.

Aviation Gasoline Output

THE production of aviation gasoline in October 1939 was 594,000 bbl. east of California, and 265,000 bbl. in California, a total of 859,000 bbl, according to reports to the Bureau of Mines in connection with a recent special survey of strategic minerals. This is equivalent to 1.6 per cent of the total output of motor fuel in that month. The canvass covered several hundred refiners, but the reports received indicated there were only about 25 producing companies in October 1939.

Judging from the grade names listed, this production included output from a great variety of methods, including the "common" ones, namely, the leading of selected straightrun fractions, polymerization-hydrogenation, catalytic cracking-reforming, and catalytic alkylation.

Stocks of aviation gasoline on hand at refineries and bulk terminals on October 31 totaled 2,400,000 bbl., comprising 1,558,000 bbl. east of California and 842,000 bbl. in California. Part of these stocks had been sold for some time but was awaiting shipment at the end of the month.

The Bureau of Foreign and Domestic Commerce has published figures on exports of aviation gasoline since the beginning of the year, the monthly totals being, in thousands of barrels: January, 553; February, 182; March, 392; April, 323; May, 692; June, 466; July, 266; August, 221; September, 206; October, 287.

As the stock figure for September 30, 1939, was not obtained, it is not possible to compute domestic demand for the United States for October. Production for October less exports gives 602,000 bbl. for domestic demand and increase in stocks. In 1938 total domestic consumption by aircraft is given as about 100,000,000 gal., or about 200,000 bbl. monthly. While there may have been a rapid increase in consumption in the past year, the figures suggest a substantial stock accumulation in October.

Aviation gasoline is distinguished from ordinary gasoline chiefly by its higher octane rating and lower vapor pressure. The octane rating of the various grades of aviation gasoline reported ranged from about 70 to about 100, but the weighted average was 84 (A.S.T.M.). This was lower than expected, indicating a large number of relatively low-compression motors are still in use both here and abroad. The average of 84 octane compares with about 72 for the regular-grade gasolines now being sold. The vapor pressure of most of the aviation gasolines was 7.0 lb., but the weighted average was 6.6 lb. This compares with about 7.5 lb. for regular gasolines sold in the summer and about 10 lb. in the winter.

The refiners were asked as to their "maximum aviation-gasoline capacity per month." The answer to this is flexible, depending largely on the crudes available and on the octane demand. Nevertheless, nearly all the producers gave a figure, which added to about 1,000,000 bbl. monthly east of California and 500,000 bbl. for California.

It is planned to publish future monthly figures of production, stocks and demand in the bureau's regular monthly petroleum statement.

By HENRY D. RALPH

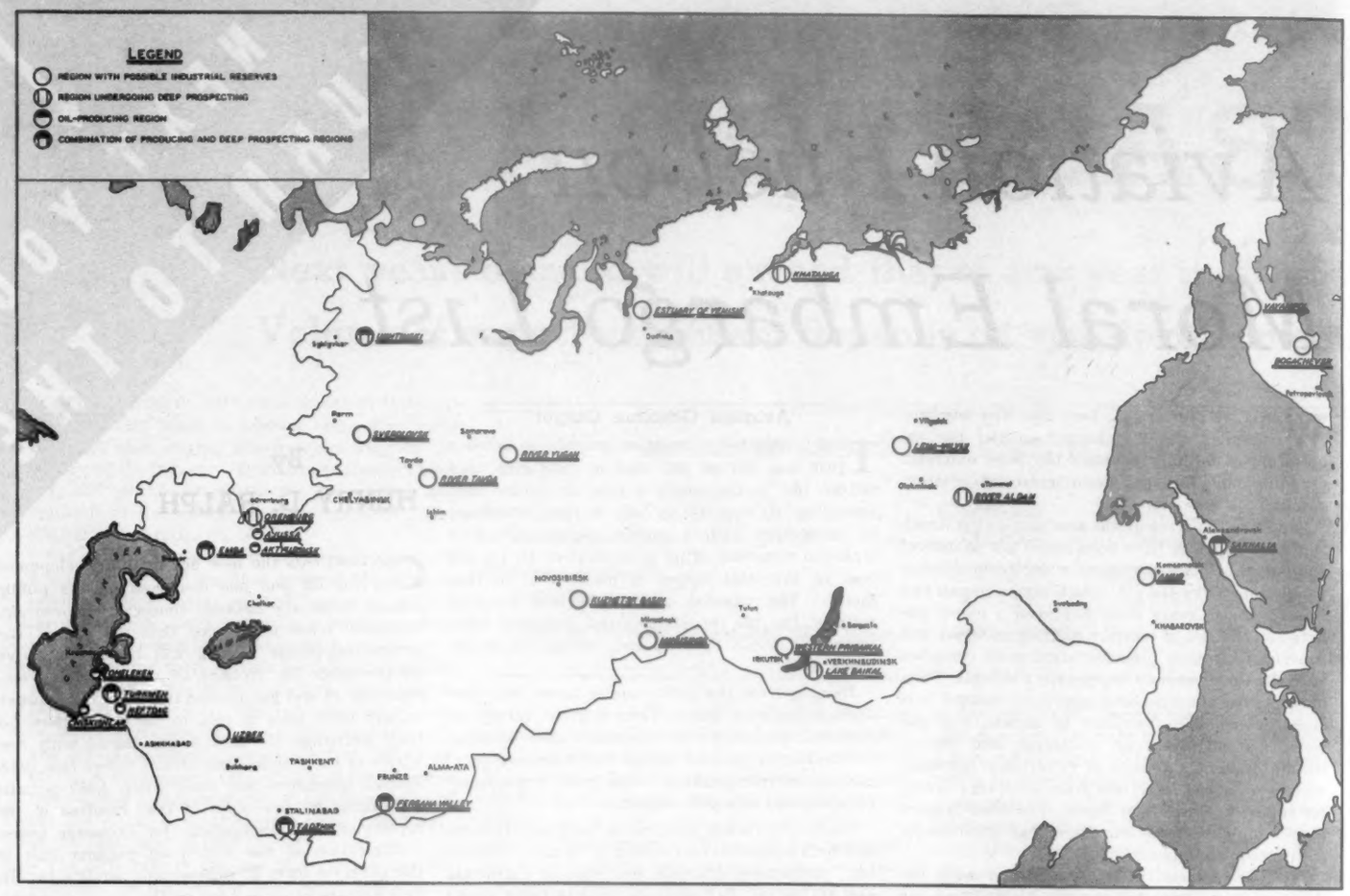
CONTINUING the new era in the development of the oil and gas resources on the public domain under the national conservation program, Secretary Ickes announced that the end of the prospecting-permit system will become effective on December 31. Holders of the remaining outstanding oil and gas prospecting permits, approximately 2,250, were warned to file applications for their exchange for new 5-year leases with registrars of the district land offices before that date. Similar procedure last year, when 4,850 permits terminated by operation of law, resulted in the receipt of 2,500 applications for exchange leases.

Expiration of the remaining permits—last of the old-style form of prospecting permits for the development of oil and gas on the public domain—will result in a modernization of procedure ordered by Congress in the oil and gas prospecting law of 1935.

Net effect of the new leasing provisions, Secretary Ickes said, has been to create a greater incentive for prudent development of the oil resources, and increased return to the Government.

Under the original leasing law it was possible to obtain an oil and gas prospecting permit covering 2,560 acres of public land, by the mere payment of a filing fee of $32. These permits could be extended for 2-year periods, and, in many instances, the prospector made no attempt to develop the property, being content to hold the permit until development was in demand by oil companies. Having been advised that approximately 8,000 permits were outstanding in which no effort at discovery had been made, Congress in 1935 enacted a law for the discontinuance of the prospecting-permit system. To protect the existing equities, the law extended the life of some of the outstanding permits, but designated December 31, 1939, as the final expiration date of all permits. Under the regulations for exchange of the outstanding permits for the new prospecting leases, applicants will be exempt from the payment of rental during the first 2 years.

NEXT YOU TURN TO THE INTERNATIONAL SECTION



Map of Asiatic Russia, showing current status of oil activity, and where exploration is in progress for the Third Five-Year Plan

Increased Production Is Tenet of U.S.S.R.'s Third 5-Year Plan

By L. DAVID WOSK

HAVE developments in the petroleum industry of the Soviet Union shown any advances during 1939? To what extent have the intensified, European diplomatic war preparations and participations affected the developments? What are the general plans for the petroleum industry for the Third Five-Year Plan, which includes 1939, and how are they being met?

These questions can best be considered under four different headings—each of which the author will take up separately.

In the preparation of this article, the author has examined reports from the American-Russian Chamber of Commerce, American Russian Quarterly, Tass Mail Service from Moscow, translations from Planovoie Khozeaestvo (organ of the State Planning Board), Industria, Pravda, Izvestia, as well as other Russian and American publications. He has also drawn upon his own experiences in the fields of the Soviet Union.

Space does not permit an extensive historical review of the petroleum developments in the U.S.S.R. Some factors should, however, be touched upon for a better understanding of recent developments.

Suffice it to say that oil has been known in Russia since the time of Alexander the Great and has been commercially exploited since the early part of the nineteenth century. Until recent years, processes were primitive and development slow and noncoordinated. The primary objective of exploitation was export, prior to 1928, and consequently development was confined to areas of easy access and transport. Baku, on the Caspian Sea, was practically the only exploited area, though production was known elsewhere. This accounts, in part, for the over-concentration (geographical) of Russian production, a condition not yet remedied.

With the extensive industrialization which commenced in 1928, the accent on exploitation was transferred to internal consumption. Development was accelerated in areas of growing industrial and agricultural importance. Development of neglected areas began. Transportation and modern refining became major problems, as did the need for modern development, technique and equipment. This drastic change in accent required a degree of coordination between various branches

A gusher in the Pata field, Baku district, U.S.S.R.

of the industry—machine construction, drilling, production, transportation and refining—heretofore unknown. The planned economic expansion on the entire front was undertaken. Previous indices of advance, chiefly production of crude oil, became meaningless. The planned development of an area might entail years of geological research, drilling, proving reserves, construction of pipe lines and refineries before a single barrel of oil might be run or reported. Areas of known prolific productivity might be neglected due to isolation or costly transportation, while stress was being placed on meager production in the immediate vicinity of areas under intensive industrial or agricultural development. Military strategy became a dominating feature. All industrial information is considered to be potentially valuable to an enemy, hence available data has been meager in the past year. This has been true throughout Europe.

Such has been the history and recent theory underlying Soviet developments to date. Her total annual production has climbed gradually from 21,390,000 tons in 1932 to 30,112,000 tons in 1938. (Some reports show 28,860,000 tons for 1938.) The 1939 production will exceed that of 1938. While the advance has never equaled the plan, each year's production has exceeded that of the preceding year. The growth of trained personnel, geological exploration, machine building, industrial development, known reserves, etc., places the Soviet Union in line for a rapid expansion of the industry, international complications permitting. These complications appear to be increasing. What is planned for the industry and how did 1939 fit into the plan?

1. Proposals Under the Third Five-Year Plan (1938-42)

Generally speaking, the preliminary draft proposals call for an increase in crude-oil production of 77 per cent by the end of 1942, an actual production for that year of 54,000,000 tons. The specific terms of the report call for:

(*a*) "A new basic oil region is to be developed between the Volga and Urals—the Second Baku region. To provide for rapid development of geological exploration work, for introduction of the best oil-drilling and oil-refining technique such as rotary-drilling methods, drilling under pressure, compressor and deep-pump mining, extraction of benzine from gas. A chain of pipe lines and oil bases, particularly in the eastern regions of the U.S.S.R., are to be developed.

(*b*) "To develop the peat industry, particularly in such districts as Svanovo, for instance, with a view to reducing the shipments of coal for long distances, as well as to increase by every means the utilization of shale fuel.

(*c*) "To develop widely the gasification of various types of fuels, including underground coal gasification which is to become an independent branch of industry. To increase the output of gas both from oil and from natural-gas deposits by 3½ times.

(*d*) "To create an industry for the manufacture of artificial fuel oils by means of hydration of hard fuel such enterprises to be built first in the eastern regions. To develop synthetic production of fuel oils from gas.

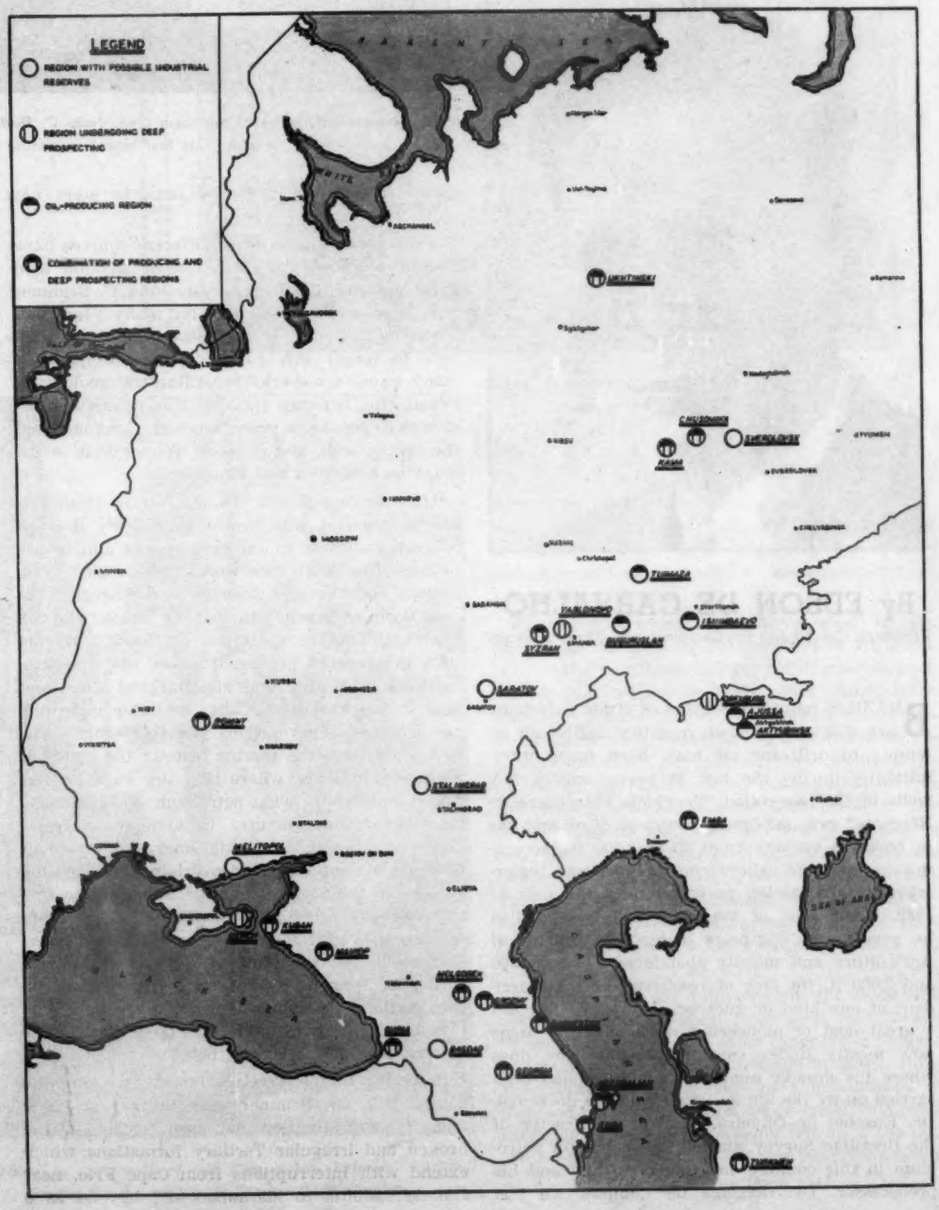
(*e*) "New oil-refining plants with a total capacity of 15,000,000 tons and new oil-cracking units with a total capacity of 4,500,000 tons are to be put into operation.

(*f*) "Geological exploration and prospecting work is to be developed in the new oil-mining regions, including the regions between the Volga and Urals, in Siberia, in the Far East and in Central Asia.

(*g*) "Construction of new metallurgical plants is to be started in South Urals and in eastern

(Continued on Page 329)

Above: When hapless Poland was conquered, the Soviet Union shared the spoils with Germany, the former acquiring the majority of Poland's oil production. As seen above, the Polish fields are located in the southeastern part of the country. Below: European Russia, in which is located the area receiving most attention—the Volga-Ural region, called "the second Baku"



Brazil's Search for Oil

What are the possibilities of developing commercial production in the fields in Brazil now under consideration?

What development has taken place to date and what have been the practical results?

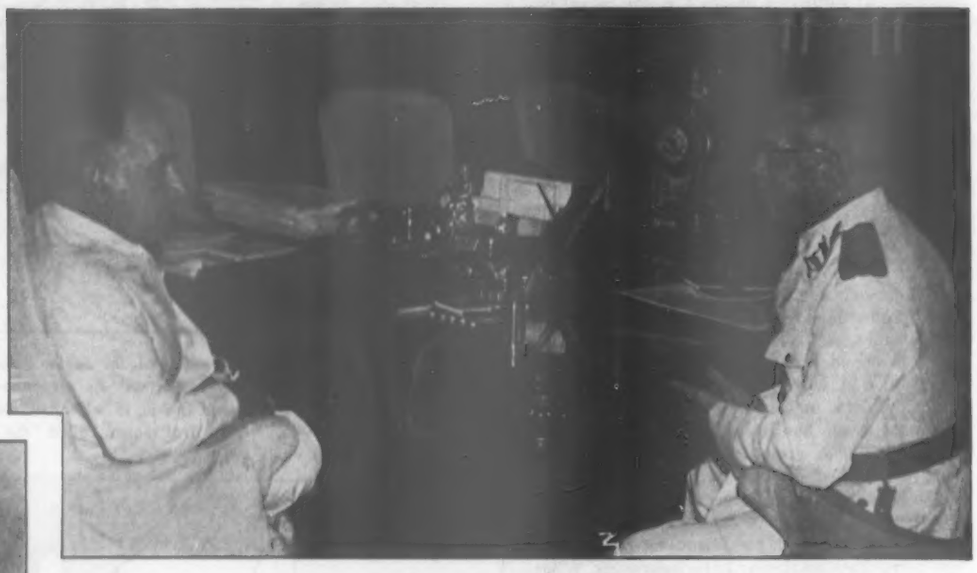
What are the areas most likely to show production first?

Will present legislation affect the development of oil fields?

Will there be monopoly of the oil industry in any form?

By EDSON DE CARVALHO

President, Companhia Petroleo Nacional, Alagoas, Brazil



Pres. Getulio Vargas, receiving from Gen. Julio C. Horta Barbosa, president of the Conselho Nacional do Petroleo, his last report regarding the petroleum situation in Brazil

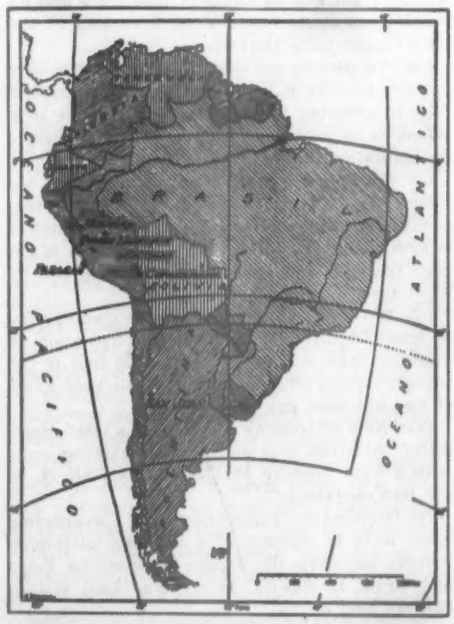
BRAZIL'S natural resources of crude petroleum are still an unknown quantity. Although attempts to drill for oil have been made intermittently during the last 40 years, only a few wells in the now-called "Provincia Petrolifera do Nordeste" gave important showings of oil and gas in horizons varying from 20 to 2,000 ft., according to the field where the drilling was undertaken. The situation prevailed until the year of 1932, when most of the wells had been drilled by government engineers under the Ministry of Agriculture and usually abandoned between 500 and 2,000 ft. for lack of resources, or some accident of one kind or another. However, they did a great deal of pioneering work, and the areas now mostly under consideration are the ones where the greater number of drillings had been carried on by the old Servico Geologico do Brazil. Dr. Euzebio de Oliveira, the former director of the Brazilian Survey, started the search for petroleum in this country and thanks to him and his predecessor, Dr. Gonzaga de Campos, we had many interesting geological data to start our work with.

Many contributions from different sources have also been added. Certainly, I must mention with great regards the name of Dr. John C. Branner, who lived and studied here for many years and when back in the United States, never seemed able to forget this country, contributing with many important works regarding the geology of Brazil. Dr. Branner traveled this country in all directions for many years, knew the language and the people well, and it is no wonder that in his heart he became a real Brazilian.

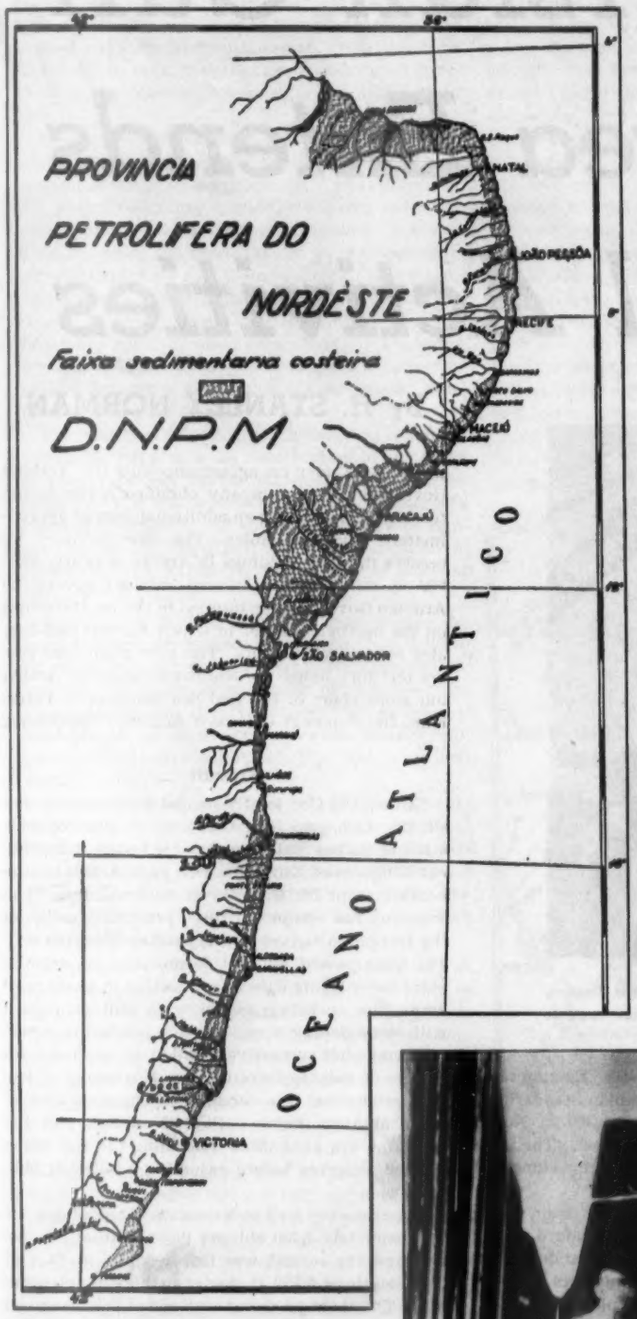
After leaving Brazil, the rest of Dr. Branner's life in America was almost exclusively devoted to work dedicated to our geology and mineral resources. One of his first works was entitled, "Cretaceous and Tertiary Geology of the Sergipe-Alagoas Basin of Brazil." In 1901, he wrote "The Oil-Bearing Shales of the Coast of Brazil." During 1922, in his work presented before the American Institute of Mining and Metallurgical Engineers held in San Francisco, Calif., he wrote regarding our Cretaceous formations the following: "The best known are the marine beds in the states of Sergipe and Bahia, where they are more or less folded and exhibit what petroleum geologists consider favorable structure. In some places, especially at Marahu in Bahia, marine Cretaceous beds are accompanied and overlain by oil-bearing shales. In the State of Sergipe, some of the Cretaceous beds are highly fossiliferous limestones of marine origin; it is quite probable that these Cretaceous rocks extend into the southwestern corner of Alagoas, where they are overlain by the Tertiary sediments. In Maranhao, also, the Cretaceous seems to underlie a large area in the eastern part of the coastal belt."

Referring to the Tertiary formation along the coastal belt, Dr. Branner went on, saying: "For many years, attention has been called to the broken and irregular Tertiary formations which extend with interruptions from Cape Frio, near Rio de Janeiro, to Maranhao and beyond as a possible source of oil. It seems quite possible that this zone may contain petroleum where it widens out and extends well into the interior, as at Bahia for 300 miles, at Mossoro, in the State of Rio Grande do Norte and at Maranhao; but elsewhere, I doubt its existence because this horizon is too narrow, too fragmentary and too thin to furnish collecting grounds for much petroleum."

However, more than 40 years went by just in the collecting of scientific data, and nobody seemed to have the least interest in the shows of live oil and gas which were found in several of the wells, and at Lobato, in Bahia, particularly



Brazil, with an area comparable to that of the United States, has yet to become an important oil-producing country, though exploration continues aggressively



Although exploration has continued for 40 years, only a few wells in the now-called "Provincia Petrolifera do Nordeste" gave important showings of oil and gas

when it was the general belief that no oil was to be found, as far as commercial production was concerned, within the boundaries of this immense country.

With a view of increasing the prospecting for and exploitation of oil in Brazil, national propaganda was started by eminent writers and we had a petroleum bill introduced into parliament. This, however, was not voted with the closing of congress by President Getulio Vargas and there is now a new mining code under which the government has issued several decrees governing the exploration, importation, distribution and refining of petroleum in this country.

A special department with full power to act was created by President Vargas for taking care of all matters connected with petroleum exploitation, refinery and commerce. This department is known as the Conselho Nacional do Petroleo and is headed by a well-known and most capable man, Gen. Julio C. Horta Barbosa, who acts as president, directly responsible only to President Getulio Vargas. Contrary to expectation, it is not likely that the Conselho Nacional do Petroleo will grow into a department similar to the Yacimientos Petroliferos Fiscales of the Argentine Government, as General Horta Barbosa has very recently clearly emphasized to the author that the government has no wish to create or allow monopoly to be created in any form or manner. It is the writer's personal belief that some of the government decrees referring to exploration will soon be modified. Our petroleum legislation is just beginning, and as soon as the administration will be convinced of the magnitude of the pioneers' work toward creating oil fields, more encouragement and help will be forthcoming to all those that in good faith wish to shoulder the hard task of opening new sources of wealth. Many new permits have been granted lately by the Conselho Nacional do Petroleo with regard to leasing of land for oil development. Many more will be applied for soon; especially so, because the government's fee is exceedingly low and the Conselho is very much interested in furthering the search for oil.

Oil seepages in Bahia and good showings of oil and gas in Alagoas were responsible for the present optimistic outlook and the measures taken by the government regarding the petroleum situation in Brazil. Many new companies have been organized and it is now the general belief that the country will be able to produce petroleum. A drilling program has been designed by the

Barreiras formation in Alagoas, a thin deposit of fine-colored sands, clay and conglomerate

Gas show in the well of the Companhia Petroleo Nacional located in the valley of Riacho Doce-Alagoas

engineering staff of the Conselho Nacional do Petroleo. Geophysical developments have been carried on by the government and the Companhia Petroleo Nacional through the government of Alagoas, with a better understanding of geological conditions governing oil accumulation than existed 30 or 40 years ago.

Further encouragement is being given by the administration with the development in this country for the first time of deep-drilling techniques, having just bought in the United States three complete rigs at a cost of almost $750,000 and at the same time, engaging capable American engineers to carry out the drilling program designed to test conclusively the possibilities for commercial production in several areas in the states of Bahia and Alagoas. The personnel to carry on the work has been contracted with the Drilling & Exploration Co., Inc., of Los Angeles, Calif., and the Oil Well Supply Co. furnished the rigs which recently started operation with at least 10 tests scheduled for both states of Bahia and Alagoas.

Our engineers are following up the work and quite a number of them have been sent abroad by the Conselho as part of its program to prepare our men for our future petroleum industry. However, notwithstanding our good possibilities in the face of geological and geophysical data, considerable apprehension is being felt as to the outcome of these tests, as we are nevertheless en-

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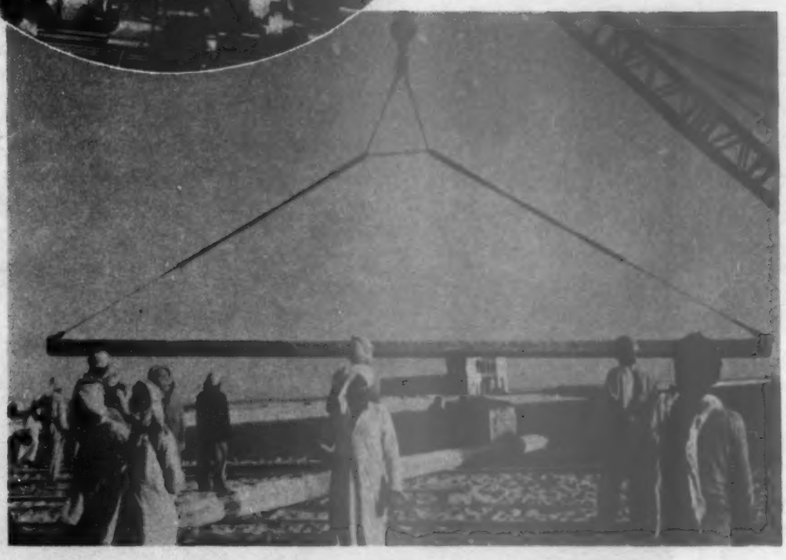
Persian Gulf Area Extends Oil Activities

By H. STANLEY NORMAN



Top: Interior of machine shop of the Bahrein Petroleum Co. Bottom: Laying pipe at Ras Tanura, eastern Saudi Arabia. Operations are of the California Arabian Standard Oil Co. Note customs

DESPITE conditions which made expansion difficult, Near East countries bordering on the Persian Gulf extended their standing in 1939 as one of the world's most important petroleum reserves.

One of the chief developments was expansion of Saudi Arabia to a full-fledged producing area. Another development of equal importance has been reported, but definite confirmation has been unobtainable under the rigid British censorship. Rumors have been reasonably well substantiated that Petroleum Concessions (Qatar), Ltd., operating subsidiary of Iraq Petroleum Co., Ltd., has completed a producing well in the region of Qatar. Petroleum Concessions drilled one failure near the coast line of the small country which extends from the Arabian mainland to within a few miles of the south end of Bahrein Island. Location for the second test was made at a greater distance from the coast and resulted in production.

Five producing wells were completed during the year by California Arabian Standard Oil Co. on the Dammam structure of Saudi Arabia, and four wells were drilling within proven limits of that field when 1939 ended. Dammam production became available to world markets for the first time during the middle of the year. California Arabian Standard Oil Co. produced approximately 4,300,000 bbl. of crude in Saudi Arabia in 1939, most of which was withdrawn after completion of 43 miles of 10-in. line from the Dammam field to the Persian Gulf Coast at Ras Tanura at midyear.

Drilling continued throughout the year on No. 1 Abu Hadriya, a wildcat 100 miles north of Dammam and a few miles inland from the Persian Gulf.

Another wildcat, California Arabian Standard Oil Co.'s No. 1 Ma'agala, is drilling at 1,300 ft. No oil had been encountered in either test. The Abu Hadriya test had reached 8,301 ft. in limestone and shale.

In addition to a field gathering-line system in the Dammam field, California Arabian Standard Oil Co. built three 59,000-bbl. tanks there, expanded camp facilities, including permanent quarters for the staff, and a crude-oil stabilization plant was under construction when the year ended.

Three tanks, with capacity of 134,000 bbl. each, were constructed at the Ras Tanura terminal of the pipe line. A sea line and marine loading terminal capable of berthing ocean tankers completed the installation.

Eight wells are producing from the lower pay zone in the Dammam field at the daily average rate of 18,000 bbl. per day. The crude obtained in the lower pay at approximately 4,500 ft. is an asphaltic-base oil of 35.5 gravity. Three wells producing in the discovery pay at 2,100 ft. account for daily average output of 160 bbl. Including the two wildcats, California Arabian Standard Oil Co. had a total of seven rotary drilling rigs engaged in exploration and exploitation. Crude obtained from the three shallow wells which have not been extended to the more prolific lower zone is approximately 50 gravity.

Faith of California Arabian Standard Oil Co., owned jointly by Standard of California and Texas Co., in the potentialities of Saudi Arabia is indicated by expansion of the concern's holdings there last July. Under an agreement with the Arabian Government, the company obtained a concession for 60 years, covering an additional area of approximately 90,000 sq. miles. The new territory increases the total holdings in Arabia to nearly 255,000 sq. miles. The additional territory covers the Arabian Government's interest in the neutral zones on the northern border in which Kuwait and Iraq also have certain rights. The new grant also covers territory along the southern border of Arabia but stops short of the Red Sea holdings of Petroleum Development (Western Arabia) Concessions, Ltd.

Kuwait

Kuwait Oil Co., jointly owned by Anglo-Iranian Oil Co., Ltd., and Gulf Oil Corp., continued operation of its heavy-duty rotary rig in the independent Kingdom of Kuwait, which joins Arabia on the north, except for the narrow neutral zones. The company has completed three producing wells on the Burgan structure and is drilling a fourth test. The year passed without formulation of definite plans for entering Kuwait production in world markets. The operating company is still concerned with establishing scope of the producing structure and each successive location is selected with a view of gaining information. Movement of Kuwait production into commercial channels will involve another major outlay of capital, and the operators are anxious to determine the full value of their reserves before assuming additional obligations.

The discovery well at Kuwait was completed for approximately 4,400 bbl. per day potential production and the second was finished late in 1938 at total depth of 3,772 ft. for even higher potentialities. The third producer was added this year and a fourth test was nearing the zone at which oil should be encountered. Reports have been circulated that the Burgan structure in Kuwait appears to be approximately 30 miles in length.

Operations in Iran, the largest producer in the Persian Gulf vicinity, followed routine lines, excepting that plans for expanding both production and refining facilities were started. Addition of modern refining processes at the Abadan plant of Anglo-Iranian Oil Co., Ltd., continued apace with technical development. Although the actively operated sections of the refinery have maintained the throughput at a relatively stable level for 2 or 3 years, most of the retired units have been maintained intact, and, in combination with the newer additions, represent the largest single concentration of potential capacity in the world.

Due to the interruption of tanker voyages between Abadan and world markets caused by war the production from Iran for 1939 is estimated slightly under the 1938 output. Since the balance between production and shipments from Abadan is maintained to a fine degree by the operators, the

bottle neck created by the war was entirely responsible for the curtailment. Trend of recent years toward expansion of withdrawals from the Haft Kel field, to permit maximum conservation practices in the Masjid-i-Sulaiman pool, continued in 1939.

Machinery was placed in motion to spread Iran production requirements to a larger area, but development of the new Gach Saran field was delayed by the war. Production in the Gach Saran field was established nearly 3 years ago between 4,500 and 6,000 ft. Since the field has not yet reached commercial exploitation, it is impossible to risk a comparison with other Iranian fields. The impression exists, however, that Gach Saran will compare favorably with the other large fields in the country and that the area will soon permit operators greater latitude in application of conservation practices in the older fields.

The first step in adding Gach Saran to regularly producing fields was the construction of 165 miles of 12-in. pipe line almost due west to the Abadan refinery. The full schedule calls for construction of another refinery and shipping terminal at Bandar Mashur on the Khor Musa, east of Abadan. Expansion of Iran has reached a stage of physical limitation at Abadan.

Exploratory drilling has given encouraging results at three other locations in Iran. Naft-i-Safid, or White Oil Springs, has been proved productive, but the 1939 exploratory results did not alter the earlier indications that the structure was comparatively small, complex, and somewhat inferior compared with Masjid-i-Sulaiman, Haft Kel, and Gach Saran.

One of the most promising areas under exploration is the Agha Jari-Pazanun structure, north of Gach Saran. Oil has been discovered at Agha Jari at approximately 8,810 ft. Geological conditions and present knowledge of the structure indicate the district will eventually compare favorably with other fields in Iran.

Exploratory drilling has been conducted in the newer fields largely toward establishing productive limits and to the accumulation of a clearer picture of the structural conditions. Heavy-duty American-type rotary rigs are required for exploratory drilling in the Pazanun district due to the depth and to high pressures encountered.

Iraq

Iraq maintained its position as the eighth largest producing country, but the 1939 estimated output of 29,500,000 bbl. (80,882 bbl. daily) was more than 12 per cent below 1938. The decline was due entirely to realignment of supplies and physical limitations of transportation. Political disturbances in Palestine caused numerous instances of sabotage along Iraq Pipe Line Co.'s transportation system from the Kirkuk field to Haifa and Tripoli. Losses of oil and operating time were held to a minimum by extensive emergency maintenance. In the final months disrupted tanker schedules caused an overall decline in shipments. Normal movement had been practically restored as the year closed.

A more important position in world markets will be assumed by Iraq. Consolidated Refineries, Ltd., jointly owned by Anglo-Iranian and Anglo-Saxon Petroleum Co. (Shell), is building a complete refinery at Haifa which will handle about 40,000 bbl. of Iraq crude daily. Combination topping and cracking units form the nucleus of the Haifa plant, and auxiliary equipment includes vapor-recovery, polymerization, acid-treating, and alkylation. Anglo-Iranian and Shell subsidiaries have call on about 47.5 per cent of Iraq Petroleum Co. production.

Included in the Iraq production program was the laying of loops along part of the pipe-line system. The arrangement will practically double capacity of the line, which is around 85,000 bbl. daily. Termination of the war will determine when the pipeline work can be undertaken.

In return for an interest-free loan of about $15,000,000, Iraq Petroleum Co., Ltd., interests were granted an extension from October 1939 for starting shipments from the British Oilfield Development concession. Another revision in the original B.O.D. concession contingent on the loan was abandonment of the clause providing for a minimum number of drilling rigs. The contract now provides for drilling a minimum of 12,000 ft. annually, which may presage deeper exploration. None of the 50-odd shallow wells drilled in the Qaiyarah-Najmah area produce on a commercial scale. They are used exclusively for supplying the government with road oil, charged against future royalty, and for fuel oil in company operations.

Decision to expand capacity of the Iraq pipe line and construction of the Haifa refinery leave little doubt that the exploration work outside Kirkuk has resulted in establishment of substantial reserves. Operators have maintained a secretive policy regarding exploratory results, and this has been accented since the war began.

Bahrein Island

Bahrein Island operations in 1939 were largely routine. Production declined to an estimated total of 7,500,000 bbl. (20,548 bbl. daily) from 8,298,000 bbl. (22,734 bbl. daily) in 1938. Bahrein curtailment permitted inclusion of some Saudi Arabian crude in the Bahrein Petroleum Co.'s refinery throughput. The refinery has been expanded in total crude capacity to 32,500 bbl. daily, and the polymerization plant last year added to its range of production.

Much work has been done on the gas-repressuring system, and the arrangement of compressors, control, and other features designed to thwart invasion and sabotage will make an interesting story when it can be told.

The Bahrein Island field now contains 62 producing wells. Four producing zones have been definitely established at 2,000, 2,250, 4.000, and 4,600 ft.

Partial view of La Plata refinery, which in September was augmented by a new combination unit for topping, cracking reduced crude, cracking heavy gas oil and light gas oil, and treating gasoline in the vapor phase

Marked Expansion in Argentina

INCREASED production, expansion in drilling operations, enlargement of refining plants, and construction of two new refineries marked petroleum developments in Argentina during the present year.

Reckoned on the basis of the results obtained during the first 9 months, the increase for 1939 in production of crude oil will be above that recorded for previous years, the total likely to be taken from the various fields being computed at something like 2,930,000 cu. m. (18,431,165 bbl.).

The following table gives the estimated 1939 production of each oil region, as compared with that of 1938:

By ING. ENRIQUE P. CANERA

Gerente General Interno Yacimientos Petroliferos Fiscales

Area—	1938 production (cu. m.)	Estimated 1939 production (cu. m.)	Difference (cu. m.)	Per cent increase
Comodoro Rivadavia	2,243,340	2,318,500	75,160	3.3
Plaza Huincul	156,881	208,500	51,619	32.9
Provincia de Salta	282,024	272,000	*10,624	*3.7
Provincia de Mendoza	31,978	131,000	99,022	309.6
Total	2,714,823	2,930,000	215,177	7.9

*Decrease. Note: One cubic meter equals 6.2905 U. S. bbl.

From the above figures it appears that the largest increase is that credited to the oil fields in the Province of Mendoza, where, about the end of 1938, the Y.P.F. discovered new deposits in the Tupungato region. The discovery well (T. 19) went down to 1,796 m. (1 m. equals 3.28 ft.) and was worked normally from November 1938, the oil continuing to flow through an 8-mm. opening. The production from this hole during its first year of operation has reached 59,568 cu. m., though the exploitation has been carried on in a conservative manner.

In 1939 three more advance-exploration wells were completed in the Tupungato region, Province of Mendoza; namely, T. 20 (completed in May), T. 21 (August), and T. 22 (October), and they have all proved good producers, particularly T. 22, which showed an initial flow of 16½ cu. m. an hour through a 10-mm. opening.

The depths attained were, respectively, 1,838.80, 1,896.95, and 2,048.12 m. At the present time three new holes are being sunk in the same region, of which T. 23 has by now reached a depth of 1,868 m. and T. 24 a depth of 1,908 m., which means they are very close to the producing formation.

Though T. 20, T. 21, and T. 22 started producing only very recently, and the four wells mentioned are being operated under restrictions, the total taken from the Tupungato fields up to November 15 amounted to 97,030 cu. m.—a sufficient confirmation of the importance of this particular discovery.

Next in order, as far as the 1939 increase in production is concerned, stands the Comodoro Rivadavia region, showing an improvement of 75,160 cu. m. over the 1938 figure. Of this amount, 38,300 cu. m. is credited to the government, the balance to private companies.

A small productive accumulation, located northwest of the government's old reserve octagon, has been incorporated into the Plaza Huincul (Neuquen) region, where the 1939 increase is figured at something like 51,600 cu. m. In the pool thus newly incorporated the Standard Oil Co. is at work and has so far drilled about 11 wells in the northern part of the Mina Chita; some of these have proved to be good producers, noteworthy items being the following: Well No. 57, initial production 166 cu. m. in 14 hours; No. 61, 80 cu. m. per day; and No. 60, 74 cu. m. per day.

Eleven Wells Drilled

Operating in the area adjacent to it, the Y.P.F. has drilled 11 wells, eight of which are producing; the best production is shown by NI. 5, starting out at 105 cu. m. per day; that of NI. 2 was 85 cu. m.; NI. 3, 45 cu. m.; and NI. 16, 70 cu. m.

The Standard's wells and also those of the Y.P.F. are under restricted exploitation, and a particularly close watch, in the case of both, is being kept on the gas-petroleum coefficient of the holes in the new producing zone.

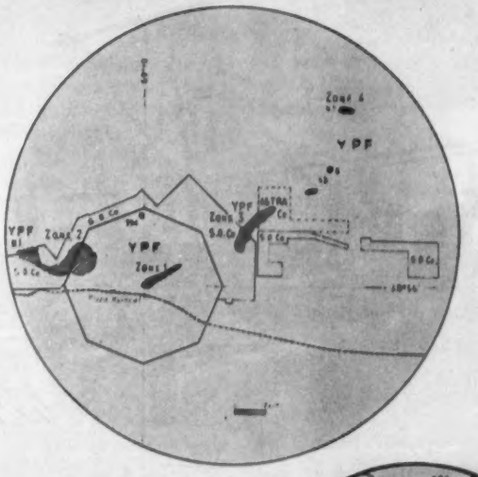
The 10,624 cu. m. at which the reduction in the yield in Salta Province is computed is accounted for by the decline which has for some time been observed in the Standard Oil Co.'s production in that region; since the Y.P.F., which is also working in Salta, has continued to increase its production, it is figured that the close of the year will show a 64 per cent improvement over the 1938 total.

The International Number of The Oil and Gas Journal for 1938 presented an estimate of that year's probable production, based on the quantity of oil taken out during the first 9 months. The totals for the full year exceeded the estimates by a goodly figure.

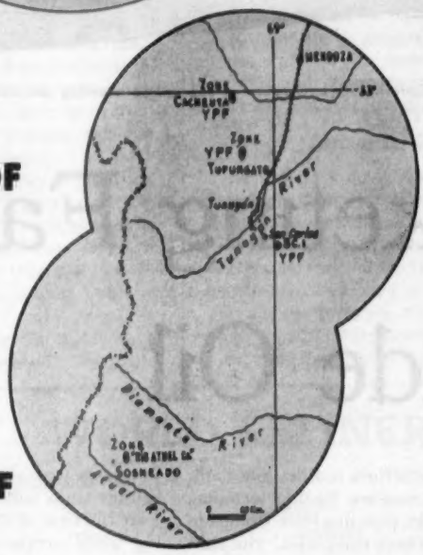
(Continued on Page 129)

La Cruz, 289G No. 1, near Lumbreras, Argentina Sociedad Anonima "Ulysramar" Petrolera Argentina

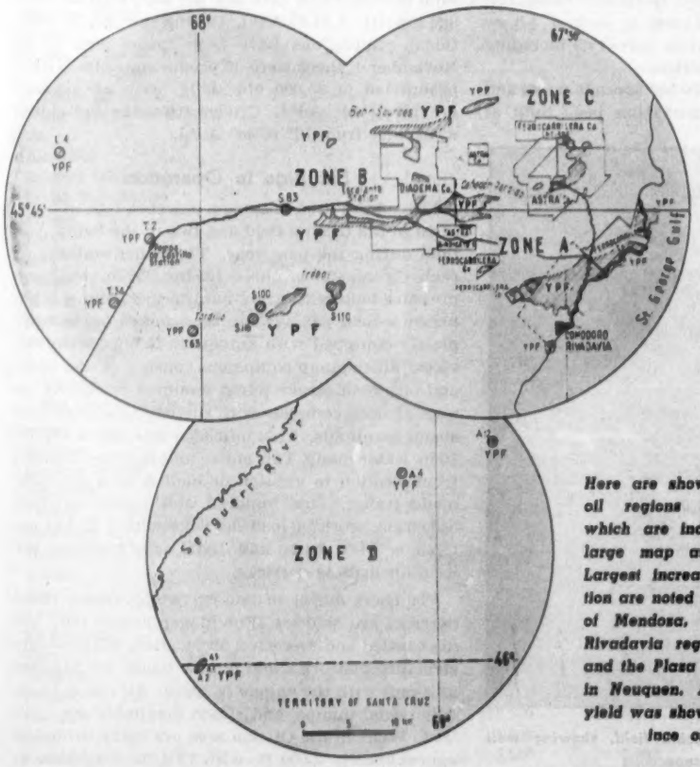
TERRITORY OF NEUQUÉN



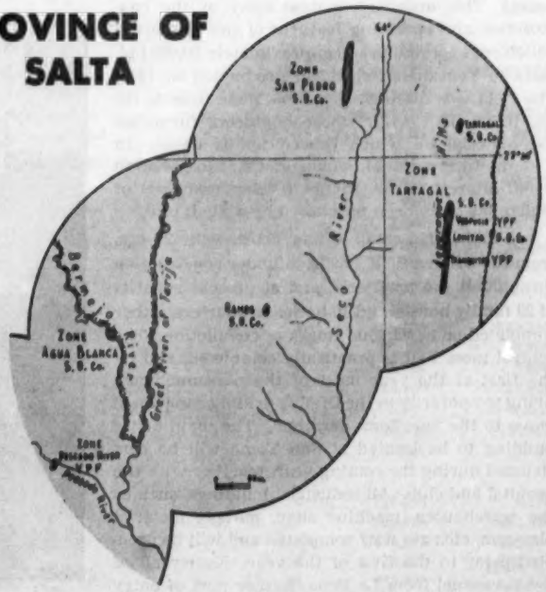
PROVINCE OF MENDOZA



TERRITORY OF CHUBUT



PROVINCE OF SALTA



Here are shown the various oil regions of Argentina, which are indicated on the large map at upper right. Largest increases in production are noted in the Province of Mendoza, the Comodoro Rivadavia region in Chubut and the Plaza Huincul region in Neuquen. A reduction in yield was shown in the Province of Salta

Left: View of slush pump taken from engine-room platform. Right: Battery of separators showing manifolding

Complete Marketing Facilities for Oficina Crude Oil

ONE of the important developments of the past year of international significance was the completion of facilities providing for the marketing of crude oil produced in the Oficina field, State of Anzoategui, in eastern Venezuela. The exploration and development of this area covered a period of more than 10 years. A 16-in. line was completed in the early fall from the field to Guanta, where a deep-sea loading terminal is located with large storage facilities. (See map of Venezuela in this issue.) This article describes many of the construction and operating features of the new areas which are expected to add approximately 50,000 bbl. daily to Venezuela's crude-oil production in 1940. The field was discovered by the Mene Grande Oil Co. (Gulf Oil Corp.), whose engineers furnished the material on which description is based. In 1937 the International Petroleum Co., Ltd., secured a half interest in the Oficina development, part of which has since been purchased by a Shell unit.

The main field camp at San Tome, some 20 km. from the Oficina field, has been under construction throughout the past year, and at present consists of 23 family houses and 10 bachelor quarters, either completed or in various stages of completion. The central mess hall is practically completed, and by the first of the year most of the personnel now living temporarily in the Oficina drilling camps will move to the San Tome terminal. The main office building to be located at San Tome will be constructed during the coming year, together with the hospital and club. All industrial buildings, such as the warehouses, machine shop, garage, material platform, etc., are now completed and will be occupied prior to the first of the year. Nearly all of the personnel from La Pena, former port of entry for all materials, has been transferred to San Tome, where the main warehouse is now operating. The company has established offices in Puerto la Cruz, Mene Grande Oil Co.'s deep-sea loading terminal, and the highway and 16-in. pipe line from Oficina to Puerto la Cruz have both been completed. The journey from the Caribbean port to Oficina camp, formerly an all-day undertaking, is now a 3-hour pleasure trip with varying scenery, including mountains, swamps, and plains.

A tank farm of four 96,000-bbl. storage tanks and four 135,000-bbl. loading tanks has been built at Puerto la Cruz, and several additional 96,000-bbl. storage tanks will be built next year.

Dual-zone completion in Oficina field, showing well-manifold connections

At the first of the year there were four producing wells completed in the Oficina field with a total production of 7,900 bbl. per day, with an average gravity of 34.5° A.P.I. During the year 26 additional completions have been made; and as of November 1, there were 30 producing wells, with a production of 35,000 bbl. daily, with an average gravity of 34° A.P.I. Crudes from the individual wells vary from 16° to 44° A.P.I.

Six Rigs in Operation

There have been six steam-powered rigs in operation in the Oficina field and two in the Santa Ana field during the past year. The boiler stations of each rig consist of three 125-hp. 350-lb. working-pressure boilers fired by natural gas from a high-pressure-field gas system, each boiler being completely equipped with automatic firing-control devices. Slush-pump equipment consists of one 18-in. and one 20-in.-stroke pump mounted integrally on a set of skids complete with suction hoist, mud and steam manifolds. This unit also includes a 4½ by 10-in. water pump. This entire unit is either skidded from location to location or hauled on a specially made trailer. One hundred and twenty-two-foot 543,000-lb. working-load derricks with 7-ft. top extension, 24-ft. base, and 10-ft. substructures are used for drilling derricks.

For short moves of one or two locations, these derricks are skidded. For longer moves they are dismantled and reerected on location. Engine substructure platforms and engine house are skidded as a unit with the engine in place. All steam lines, boiler feed pumps, and steam manifolds are unitized. Wells in the Oficina area are being drilled to approximately 2,000 ft. with 13½-in. drag bits, at

which point 10¾-in. surface casing is set. After a minimum of coring and formation testing of the more important horizons, using 6½ or 6¾-in. wireline core barrels, the well is then drilled to approximately 6,300 ft., drilling 9¾ or 9⅞-in. holes with both rock and drag bits. An electrical survey of the hole is made, after which the 7-in. oil string is run. This oil string is cemented either on top of the productive horizon or completely through it, as the conditions may warrant. Single, dual, or triple-zone completions may then be endeavored, depending upon the results of the electrical survey, cores, and formation tests.

The first few wells in the Oficina field were completed with a casing program consisting of 800 ft. of 16-in. casing, 3,000 ft. of 11¾-in. casing, an oil string of 8⅝-in. casing, and a 3-in. string of tubing. The present casing program consists of 2,000 ft. of 10¾-in. casing, a 7-in. oil string, and 2½-in. tubing.

To date 15 completions have been made with the oil string on top of producing sands and setting a perforated liner with 6⅝-in. or 5-in. o.d. with ⅛-in. perforations. The remainder of the completions, including all dual-zone completions have been made by running the oil string through the petroliferous horizon and gun perforating. The deeper producing sands are comparatively well consolidated and no sand troubles have been experienced, either through producing through perforated liner, or perforated casing. The dual-zone completions have been made by perforating two different favorable zones and packing off between the two with an ordinary hook-wall type tubing packer, producing the lower sand through the tubing and the upper sand through the annular space between the 2½-in. tubing and the 7-in. casing.

Approximately 1¾ million barrels of oil have been produced to fill the storage now available in the Oficina and Guanta tank farms. The production of this oil has supplied a fair knowledge of the producing characteristics of the various Oficina sands. The gravities range from 16° to 44° A.P.I., the average gas-oil ratio is 1,000 cu. ft. per barrel, the average casing-head pressure is 1,000 lb., the average tubing-head pressure is 500 lb. and the average initial bottom-hole pressure is 1,780 lb. at a subsea datum of 4,000 ft. These average characteristics are for production from 3,900 ft. to 6,300 ft. and to date commercial production has been obtained from 11 different sands in this interval. A general practice has been to flow the wells at the most favorable rate, based on studies and comparisons of gas-oil ratios and flowing bottom-hole pressure differentials.

View of Oficina gathering station No. 1, showing tanks, stairway, separators, flow-line manifolds, gagers' house, part of pump house and regulators for gas-engine supply

Gathering Systems

These wells are being flowed into three gathering stations, each station consisting of a battery of three separators manifolded to handle the production from approximately 20 wells. One of these separators is reserved for test work and individual wells are tested at least once each week. Closed-in bottom-hole pressure surveys are taken on the average of once each month per well. The oil and gas are series-separated in each station through the remaining two separators with approximately one-fourth of the pressure on the first separator being carried in the second. The capacity of each of these three stations is approximately 20,000 bbl. per day. The tankage at each station consists of one 1,500-bbl. test tank and either two 10,000-bbl. or four 5,000-bbl. flow tanks. The crude oil is gaged in these gathering stations and then pumped through 6-in. gathering lines to the main 10-in. field gathering line which connects the field stations to the Oficina tank farm, approximately 10 km. to the north of the center of the field. It is also possible to pump directly into the Puerto la Cruz storage tanks from all gathering stations.

The Oficina tank farm at present consists of four 96,000-bbl. welded steel tanks, and is connected to the deep-sea loading terminal at Puerto la Cruz by 150 km. of 16-in. welded pipe line. The pumping facilities at the Oficina tank farm have a capacity of approximately 90,000 bbl. daily. At Puerto la Cruz there are four 96,000-bbl. welded steel tanks and four 135,000-bbl. floating-roofed tanks. The 16-in. pipe line which parallels the Oficina-Guanta road will eventually serve as a trunk line for other fields in this section of eastern Venezuela, such as San Joaquin, Santa Ana, El Roble, Merey, Chive and Yopales.

WORLD REFINERY CAPACITIES

Recapitulation by Countries (See Breakdown by Plants Beginning on Page 78)

Country—	Number of refineries	Capacities Crude	Capacities Cracking
Africa:			
Belgian Congo	1	250	150
Egypt	2	17,000	4,100
Union of South Africa	1	1,000	.....
Total Africa	4	18,250	4,250
Per cent of world total	.43	.24	.13
Asia:			
Australia	3	4,100	.....
Bahrein Island	1	32,500	12,000
British East Indies	1	10,000	.....
Burma	7	37,000	10,800
Iran	3	333,000	155,000
Iraq	2	4,000	.....
Japan	17	52,600	16,250
Manchukuo	1	3,000	850
Netherland East Indies	7	170,000	36,500
Palestine	1	40,000	20,000
Total Asia	43	686,200	251,200
Per cent of world total	4.64	9.07	7.66
Europe:			
Belgium	7	12,175	2,300
Canary Islands	1	5,000	4,100
Denmark	1	500	.....
France	19	151,550	72,900
Germany	60	68,770	7,290
Hungary	7	11,670	350
Ireland	2	10,600	.....
Italy	10	41,300	14,600
Latvia	1	200	.....
Netherlands	1	15,000	12,500
Norway	1	1,200	.....
Portugal	1	4,000	1,500
Poland	29	23,050	2,300
Rumania	28	238,300	45,800
Spain	1	1,500	.....
Sweden	1	3,500	2,700
United Kingdom	18	113,350	20,500
U.S.S.R.	19	637,500	178,500
Yugoslavia	3	4,300	.....
Total Europe	210	1,343,965	365,340
Per cent of world total	22.65	17.77	11.14
North America:			
Canada	48	203,000	85,500
Cuba	1	4,200	2,100
Mexico	13	98,100	29,100
United States	560	4,461,120	2,108,025
Total North America	622	4,766,420	2,224,725
Per cent of world total	67.10	63.00	67.82
South America (including Trinidad):			
Argentina	16	102,555	36,650
Bolivia	2	725	.....
Brazil	2	3,960	.....
British West Indies (Trinidad)	7	49,300	28,350
Chile	3	535	.....
Colombia	2	14,500	.....
Ecuador	3	2,350	.....
Netherland West Indies	3	495,000	338,200
Peru	3	22,000	6,800
Uruguay	1	5,000	2,000
Venezuela	6	54,900	22,800
Total South America	48	750,825	434,800
Per cent of world total	5.18	9.92	13.25
Continent—			
Africa	4	18,250	4,250
Asia	43	686,200	251,200
Europe	210	1,343,965	365,340
North America	622	4,766,420	2,224,725
South America	48	750,825	434,800
Total world	927	7,565,660	3,280,315

The Tupungato field in the Province of Mendoza, where Argentina's largest well was completed for more than 5,000 bbl. daily late in October

Survey of World Oil Fields

ALBANIA

Name of field and location—	Producing wells	Daily av. prod. (bbl.)	Wells drilling	Producing depths	Gravity A.P.I.	Base of crude	Outlet	Age of field (years)
Devoli	420	2,525	20	1,950-2,950	16	A.	P.L.	5

ARGENTINA

(Development as of September 30, 1939)

Comodoro Rivadavia (Chubut):								
Zone A, (coast)	1,771	11,737	18	2,200-2,500	22.3	A.-P.	Tankers	32
Zone B, (Escalante)	512	26,105	22	3,675-3,775	31	A.-P.	Tankers	15
Zone C	360	2,850	7	1,970-2,150	19.8	A.-P.	Tankers	23
Zone D, (Col. Sarmiento)	...	.....	..	2,295-2,625	23	A.-P.	Tankers	6
Plaza Huincul (Neuquen):								
Zone No. 1	49	145	..	1,875-1,990	32	P.	Tank cars	21
Zone No. 2	112	2,378	2	2,365-2,510	31.7	P.	Tank cars	13
Zone No. 3	116	874	..	2,400-2,590	33.5	P.	Tank cars	15
Zone No. 4	1	7	..	3,360-3,365	38.5	P.	Tank cars	5
Province of Salta:								
Zone Tartagal	124	1,830	4	1,470-1,770	43.4	P.	Tank cars	13
Zone San Pedro	30	2,629	..	2,900-2,975	45.5	P.	Tank cars	11
Zone Agua Blanca	10	†208	3	4,590-4,920	23	A.	Tank cars	13
Province of Mendoza:								
Zone Cacheuta	25	170	..	2,000-2,050	30.7	A.-P.	Tank cars	8
Zone Tupungato	8	2,415	3	5,810-6,000	30.2	P.	Tank cars	6
Zone El Sosneado	...	.....	..	545- 555	13	A.	Tank cars	14
Total Argentina	3,118	51,348	59					

The principal producers and refiners in Argentina are Yacimientos Petroliferos Fiscales (Y.P.F.) owned by the Argentina Government, and subsidiaries of the Standard Oil Co. (New Jersey) and Royal Dutch-Shell. †Not in regular exploitation.

ALBERTA, CANADA

Turner Valley, 40 miles from Calgary								
Limestone crude	94	*20,000	18	6,800-8,600	39-48 av. 43	Intermediate (wax brg.)	P.L.-Ref.	3½
Limestone distillate	†101	175	..	3,700-6,800	55-73 av. 64	Intermediate (wax brg.)	P.L.-Ref.	15
Limestone natural gasoline	above	815	..	.....	73	Paraffin	P.L.-Ref.	..
Shallow crude	3	20	..	3,200-3,700	49-50	Intermediate (wax brg.)	P.L.-Ref.	25
Red Coulee, Montana border	7	35	..	2,500	30	Intermediate	P.L.-Ref.	10
Wainwright, 150 mi. east of Edmonton	5	30	..	2,200	18-22	Hybrid.	Local	14
Miscellaneous:								
Dina, Saskatchewan border	2	10	1	1,700	14-16	Naphthenic ?	Local	4
Lloydminster, Saskatchewan border	1	?	..	1,750-1,900	14	Naphthenic ?	Local	New
Vermilion, near Saskatchewan border	1	?	..	1,850	15	Naphthenic ?	Local	New
Del Bonita, Montana border	2	75?	..	5,200	35-37	Intermediate	Local	New
Moose, 30 mi. west of Calgary	1	7	..	1,600	48	Intermediate	....	2
Taber, S. E., Alberta	1	‡40	1	3,200	29	Intermediate	....	1½
Total Alberta	219	21,207	20					

*Prorated to this figure (mean annual.) †101 wells capable of producing, 83 recently in use. ‡Production suspended.

BAHREIN ISLAND, Persian Gulf

Bahrein Island, Persian Gulf	62	20,000	1	{ 2,000-2,250 } { 4,000-4,600 }	33.0	M.	Refinery	7

Bahrein Petroleum Co., Ltd., (Texas Co. and Standard Oil Co. of California) produces and refines all petroleum.

BOLIVIA

Sanandita, Tarija Dept.	5	240	3	1,345-2,017	41.5	P.	Refinery	13
Camiri, Santa Cruz Dept.	2	285	2	2,815-3,300	52.5	P.	Refinery	12
Bermejo	4	.....	..	699-3,675	...	..	Shut in	..
Buena Vista	1	.....	..	3,166	...	..	Shut in	..
Camatindi	3	.....	..	2,346-4,806	...	..	Shut in	..
Saiporo	1	.....	..	2,073-2,730	...	..	Shut in	..
Chapare		.....	1					
Total Bolivia	16	525	6					

COLOMBIA

Name of field and location—	Producing wells	Daily av. prod. (bbl.)	Wells drilling	Producing depths	Gravity A.P.I.	Base of crude	Outlet	Age of field
Infantas, Santander	451	12,760	0	2,000	25.4	Mixed	Local & Export†	21
La Cira, Santander	569	47,277	7	3,500	25.4	Mixed	Local & Export†	13
Petrolea, N. Santander	62	*15,000	7	475-1,600	43	Mixed	Line to Covenas‡	§6
Rio de Oro, N. Santander	8	Shut in	1	2,400	30	Mixed	None‡	¶2
Carbonera, N. Santander	1	40	1	1,900	19	Mixed	Local	‖1
Total Colombia	1,091	75,077	16					

*Currently this production is varied according to requirements, plus or minus 15,000 bbl. per day. †Crude produced by Tropical Oil Co. (International Petroleum Co., Ltd.) Part of crude refined locally. Remainder transported to coast by Andian National Corp., Ltd. ‡Crude produced by Colombian Petroleum Co. (Texas Co. and Socony-Vacuum Oil Co., Inc. §Although Petrolea was proven productive in February 1933, the South American Gulf pipe line which extends from the Barco concession to the shipping terminal at Covenas, was placed in operation in October 1939. ¶The first producer at Rio de Oro was completed in November 1937. ‖This field has been producing road oil since July 1, 1939.

CZECHOSLOVAKIA (Now Germany)

Gbely (Egbell)	7	288	3	540- 790	20	M.	Local	26
Hodonin (Guding)	15	127	2	425- 485	19	M.	Local	20
Total Czechoslovakia	22	415	5					

DOMINION REPUBLIC

Maleno	2	90	..	475	19	P.	Fuel	½
Quita Coraza	..	.....	1	.....	..	..	....	..

*One of the two wells is shut in and the other is produced at a rate restricted to drilling-fuel requirements.

ECUADOR

El Tambo	8	5	2	1,200	34	N.	....	8
Concepcion	5	28	1	.....	38	M.	....	9
Cautivo	85	200	2	30-1,000	18-32	M.	....	17
Ancon	488	5,800	3	1,200-3,800	36-41	P.N.	....	19
Carolina and Santa Paula	21	170	1	30- 600	18-28	M.	....	7-21
Total Ecuador	607	6,203	9					

Note: The Cautivo and the Carolina-Santa Paula fields contain pits averaging 30 ft. in depth and producing small amounts of low-gravity oil and deeper wells which produce the high-gravity crude.

EGYPT

Hurghada	77	2,404	1	1,595-1,720	36	M.	Refinery	26
Ras Gharib	20	12,500	3	3,500	38	M.	Tankers	2
Total Egypt	97	14,904	4					

FRANCE

Pechelbronn, Bas Rhin	763	1,421	17	820-3,050	29.5	P.	...	204
Bon Draa, Morocco	35 }	89.5	3	270-3,115	(*)	..	....	3
Tselfat, Morocco	49 }							
Tliouanet, Algeria	11	5.2	1	.....				28
Total France	858	1,515.7	21					

*Gravity unavailable but low.

GERMANY

Old Reich:								
Nienhagen	...	6,269.54	..	3,600	30	P.	....	78
Wietze	...	811.88	..	985	18	A.	....	80
Oberg	...	264,24	..	1,300	35	P.	....	20
All others	...	5,095.57	..	.....	25	Var.	....	..
Total	...	12,441.23	..					
Ostmark (Austria):								
Zistersdorf and Gaiselberg	...	2,033	..	3,600	23	P.-M.	....	7
Slovakia and Moravia:								
Egbell-Goeding	...	327	..	1,300	27	N.	....	25
Total for Greater Germany	...	14,801.23	..					

Note: There is no information available on the number of producing or drilling wells in Germany.

HUNGARY

Bukkszek	24	50	8	335- 340	34	P.	P.L.-T.C.	3
Budafa-Puszta	16	4,000	4	3,675-4,100	40	P.	P.L.-T.C.	3
Total Hungary	37	4,050	12					

INDIA-BURMA

India:								
Digboi, Assam	200	4,175	3	500-5,600	30-40	P	P.L.-Ref.	51
Attock Punjah:								
Khaur	150	270	4	100-6,000	35-42	P	P.L.-Ref.	
Dhulian	10	508	3	3,800-7,800	40-45	P	P.L.-Ref.	2
Burma:								
Indaw, Minbu	80	200	..		36-42	M	P.L.-Ref.	..
Singu	568	9,380	5	1,800-5,000	45	M	P.L.-Ref.	..
Thayetmyo	...	157	..	600-2,500	45	M	P.L.-Ref.	..
Upper Chindivin	...	196	..	.....	..	M	P.L.-Ref.	..
Yenangyat-Lanywa	330	1,962	3	400-4,200	32-60	M	P.L.-Ref.	..
Yenangyanung	2,910	9,535	6	300-6.000	45	M	P.L.-Ref.	..
Total India-Burma	4,248	26,383	24					

(Continued on Page 142)

San Lorenzo, Venezuelan refinery of the Caribbean Petroleum Co.

World Oil-Refineries Survey

Company and address—	Location of plant	Superintendent	Crude capacity (bbl. dly.)	Type of refinery	Cracking equip. Capacity (bbl. dly.)	Cracking equip. Type	Operating status
ARGENTINA							
Cia. Astra, Buenos Aires, Calle 25 de Mayo 145, Buenos Aires	Comodoro Rivadavia	.....	5,000	Dehyrating plant			
Compania Ferro-Carrilera de Petroleo, Cangallo 564, Buenos Aires	Comodoro Rivadavia	G. H. May	8,000	S-C	2,000	Cross	Op.
Cia. Nativa de Petroleos, S.A., Avenida Roque Saenz Pena 567, Buenos Aires	Campana	J. J. Horigan	16,000	.....	8,800	Link Tube & Tank	Op.
Cia. Nativa de petroleos, S.A., Avenida Roque Saenz Pena 567, Buenos Aires	Bahia Blanca	J. J. Horigan	2,000	S-C	1,500	Cross	Op.
Compania Petrolifera Andina, San Martin, 66, Buenos Aires	Mendoza	H. A. W. Myrin	1,750	S-L	None	None	Op.
"Diadema Argentina" S.A. de Petroleo (Shell), Avenida Roque Saenz Pena 615, Buenos Aires	Buenos Aires	J. Ph. van Goethem	20,000	S-C	14,400	Dubbs	Op.
"El Condor," Buenos Aires (3 plants), Levalle 27, Avellaneda	Avellaneda	M. Morales	1,600	S-L	None	None	Op.
Compania "la Isaura" S.A., Avenida Roque Saenz Pena, 699, Buenos Aires	Bahia Blanca	Wm. Fergusson A. J. Latour	2,000	S-C	850	Dubbs	Op.
Standard Oil Co., S.A., Argentina, Avenida Roque Saenz Pena 567, Buenos Aires	Embarcacion	J. J. Horigan	575	S	None	None	Op.
Standard Oil Co., S.A., Argentina, Avenida Roque Saenz Pena 567, Buenos Aires	Plaza Huincul	J. J. Horigan	200	S	None	None	Op.
Ultramar, S.A., Petroleo Argentina, Calle Chile 778, Buenos Aires	Buenos Aires		5,900	Comp.	2,600	deFlorez	Op.
Yacimiento Petroliferos Fiscales, R.S. Pena 777, Buenos Aires	La Plata	Dr. A. Zanetta	31,450	Comp.	4,500	Cross	Op.
Yacimiento Petroliferos Fiscales, R.S. Pena 777, Buenos Aires	Godoy Cruz	Sr. Fermo Monti	630	S	None	None	Op.
Yacimiento Petroliferos Fiscales, R.S. Pena 777, Buenos Aires	Plaza Huincul	Hector A. Gonzalez	450	S	None	None	Op.
Yacimiento Petroliferos Fiscales, R.S. Pena 777, Buenos Aires	Vespucio	Sr. Rafael Llabre	500	S	None	None	Op.
Yacimiento Petroliferos Fiscales, R.S. Pena 777, Buenos Aires	Campana	Dr. Americo Piccioni	2,000	S-C	1,000	Cross	Op.
Yacimiento Petroliferos Fiscales, R.S. Pena 777, Buenos Aires	San Lorenzo	Dr. J. Canessa	9,500	Comp.	3,000	Gyro	Op.
Total Argentina			102,555	.....	36,650		
AUSTRALIA							
Commonwealth Oil Refineries, Ltd. (Anglo-Iranian), Scottish House, 90 William St., Melbourne	Laverton, near Williamston	G. F. McKillop	2,000	S	None	None	Op.
Newport Oil Refinery, Ltd., Melbourne	Newport	G. Turner	100	L	None	None	Op.
Shell Co. of Australia, Ltd., Bourke and William Sts., Melbourne	Clyde, N.S.W.	V. S. Smith	2,000	S-C	1,000		Op.
Total Australia			4,100		1,000		
BAHREIN ISLAND							
Bahrein Petroleum Co., 135 East Forty-second St., New York	Bahrein I., Persian G.	.....	32,500	S-C	12,000	Dubbs	Op.
Total Bahrein Island			32,500		12,000		
BELGIUM							
Belgian Cracking Co., S.A., 31 rue de la Science, Brussels	Langerbrugge	C. Razvan-Penescu	500	S-C	300	Dubbs	Op.
Belgo Petroleum Co., Terdonck	Terdonck	P. D'Hoker	1,200	S-C	1,000	Jenkins	Op.
Raffinerie Belge de Petroles, 115 Avenue de France, Antwerp	Antwerp	G. Henen	3,800	S-C	1,000	Jenkins	Op.
Raffineries et Distilleries Anversoises, Place Leopold 10, Antwerp	Antwerp	O. Mathey	2,000	S	None	None	Op.
Societe Chimiquede Selzaete, 29 rue Ducale, Brussels	Selzaete	Addison Leonard	175	S	None	None	S.D.
Redeventza Societe Anon. Belge, Rive de l'Escaut, Antwerp-Kiel	Antwerp-Kiel	Dr. F. Kind	3,000	S-C	1,000		Op.
Compagnie Industrielle Atlas S.A. Belge, 101 Avenue de France, Antwerp	Antwerp	Dr. Van Hertbruggen	1,500	S	None	None	Op.
Total Belgium			12,175		2,300		
BELGIAN CONGO							
Compagnie Financiere Belge des Petrole (Petrofina), r rue Wappers, Antwerp	Leopoldville	L. Wolters	250	S-C	150	Carburol	Op.
Total Belgian Congo			250		150		
BOLIVIA							
Yacimiento Petroliferos Fiscales Bolivia, Calle Reves Ortiz 69, La Paz	Sanadita	G. J. Elder	375	.....	None	None	Op.
Yacimiento Petroliferos Fiscales Bolivia, La Paz	Camira	G. J. Elder	350	.....	None	None	Op.
Total Bolivia			725				
Both above refineries built by Standard Oil Co. of Bolivia.							
BRAZIL							
Standard Oil Co. of Brazil, Caira do Correio 970, Rio de Janeiro	Sao Paulo	.....	2,160	.....	None	None	S.D.
Ipiranga, S.A., Companhia Brasileira de Petroleos, Saco de Mangueira, sem numero, P. O. Box 56, Rio Grande	Rio Grande	Tomaz Pais Cunha	1,800	.....	None	None	Op.
Total Brazil			3,960				
CANADA							
Detailed information on Canadian refineries appeared in the March 30, 1939, issue of The Oil and Gas Journal.							
Total capacity			203,000	.....	80,500		
CANARY ISLANDS (Spain)							
Compania Espanola de Petroleos, S.A., Plaza de las Cortes 3, Madrid	Santa Cruz de Teneriffe	J. Lliso	5,000	.....	4,100	Dubbs	Op.
Total Canary Islands			5,000		4,100		
CHILE							
Cia. de Salitre, Y.F.C. de Agua Santa, Iquique	Iquique	.....	300	.....	None	None	Op.
Soc. Establecimentos Fulmicos, Ave. San Martin 1400, de Vina Del Mar, Vina Del Mar	Del Mar	.....	175	.....	None	None	Op.
Maritano, Miguel, Calle Colon No. 849, Talcahuano	Talcahuano	.....	60	.....	None	None	Op.
Total Chile			535				

COLOMBIA

Company and address—	Plant location	Superintendent	Crude capacity (bbl. dly.)	Type of refinery	Cracking equip. Capacity (bbl. dly.)	Cracking equip. Type	Operating status
Tropical Oil Co., Apt. 170, via Cartagena, El Centro	Barranca Bermeja	.....	14,000	.....	None	None	Op.
Colombian Petroleum Co., 135 East Forty-second St., New York	Petrolea	.....	500	.....	None	None	Op.
Total Colombia			14,500				

CUBA

Standard Oil Co. of Cuba, Apartado 1303, Havana	Belot	F. B. Preston	4,200	L-A	2,100	Tube & Tank	Op.
Total Cuba			4,200		2,100		

DENMARK

Dansk Mineraloliefabrik, A.S., 5-15 Copenhagen	Copenhagen	.....	500	S	None	None	Op.
Total Denmark			500		None		

ECUADOR

Anglo-Ecuadorian Oilfields, Ltd., 146 Dashwood House, Old Broad St., E.C. 2, London, England	La Libertad	B. M. Craig	2,200	.....	None	None	Op.
Ecuador Oilfields, Ltd., River Plate House, Finsbury Circus, E.C. 2, London, England	Cuativo	.....	100	.....	None	None	Op.
Refinery Viggiani, Salinas	Carolina	.....	50	.....	None	None	Op.
Total Ecuador			7,350				

ESTONIA

A.G. Kivoli			500	.....	....	.....	Op.
Three others			500	.....	....	.....	Op.

EGYPT

Anglo-Egyptian Oilfields, Ltd., St. Helen's Court, Great St. Helen's E.C. 2, London, England	Suez		15,000	.....	4,100	Dubbs	Op.
Raffinerie de Petrole du Government, 18 Rue Fouad Ier, Alexandria	Suez	A. H. Defrawi Eff	2,000	.....	None	None	Op.
Total Egypt			17,000		4,100		

FRANCE

Compagnie Francaise de Raffinage, 11 Rue du Docteur Lancereaux, Paris (8)	Gonfreville	R. Perrin	36,000	Comp.	8,800	Cross	Op.
Compagnie Francaise de Raffinage, 11 Rue du Docteur Lancereaux, Paris (8)	Martigues	R. Perrin	20,000	S-C	5,900	Cross	Op.
Compagnie Industrielle des Petroles, S.A.F., 54 Rue de Londres, Paris	Frontignan-Sete	P. Gueret-Bellemare	5,000	Comp.	3,200	Kellogg	Op.
Raffineries de la Vacuum Oil Co., S.A.F., 46 Rue de Courcelles, Paris	Gravenchon	.....	6,000	L-W-A	2,300	Kellogg	Op.
Compagnie des Produits Chimiques et Raffineries de Berre, 55 Rue d'Amsterdam, Paris (8)	Berre	.....	10,000	Comp.	4,500-6,500	Houdry	Op.
Les Propetrol Consommateurs de Petrole, Paris	Donges	.....	3,500	.....	None	None	Op.
Pechelbronn Societe Anonyme d'Exploitations Minieres, 32 Allee de la Robert sau, Strasbourg	Merkwiller-Pechelbronn	A. Pellisier	2,500	.....	1,000	Winkler-Koch	Op.
Pechelbronn-Ouest, Soc. Anon. (subsidiary of above), 4 Rue Roussel, Paris	Donges	A. Rimailho	5,000	.....	None	None	Op.
Brest Port Petrolier (subsidiary of Pechelbronn Soc. Anon.), 4 Rue Roussel, Paris	Brest	A. Pellisier	2,000	.....	None	None	Op.
Raffinerie de Petrole du Nord, 19 Rue du General Foy, Paris, 8e	Dunkirk	R. Francois	10,000	.....	2,000	Winkler-Koch	Op.
Raffineries de la Vacuum Oil Co., S.A.F., 46 Rue de Courcelles, Paris	Port Jerome	.....	6,500	.....	2,300	Kellogg	Op.
Societe Anon. des Petroles Jupiter (Shell), 42 Rue Washington, Paris, 8	Pauillac	J. Vidal	10,000	.....	7,000	Dubbs	Op.
Societe Anon. des Petroles Jupiter, 42 Rue Washington, Paris, 8	Rouen	J. Vidal	15,000	.....	7,000	Dubbs	Op.
Societe Lyonnaise de Schistes Bituminex (Shale), 21 Rue de Paris, Paris	Autun	M. Boulzaguet	750	.....	400	Dubbs	Op.
Societe de Raffinage des Huiles de Petrole (subsidiary of Anglo-Iranian), 19-21 Rue de la Bienfaisance, Paris, 8e	Courcheletts	F. Gilabert	5,000	.....	2,000	Cross	Op.
Societe de Raffinage des Huiles, 19-21 Rue de la Bienfaisance, Paris, 8e	L'Avera	F. Gilabert	8,000	.....	3,000	Cross	Op.
Societe des Raffineries de Petrole de la Gironde (Texas Co. interested), No. 7 Place Vendome, Paris	Bordeaux	.....	6,300	.....	5,000	Dubbs and Cross	Op.
Standard Francaise des Petroles S.A., 82 Ave. des Champs Elysees, Paris	Port Jerome	R. B. Young	24,000	S-C	12,000	Tube & Tank	Op.
Standard Francaise des Petroles, 82 Ave. des Champs Elysees, Paris	La Maillerave	R. B. Young	Reduced crude operation				Op.
Total France			151,550		72,900		

GERMANY
(Czechoslovakia)

Apollo Mineraloel Raffinerie, A.G., Culenova ul 3, Bratislava	Regenszurg	.....	1,800	S-C	1,100	Dubbs	Op.
Apollo Mineraloel, Culenova ul 3, Bratislava	Welkersdorf	.....	400	S	None	None	Op.
Fanto-Werke Aktien-Gesellschaft, Jozsef-ter 3-4, Bud pest, 5	Pardubice	L. Fenyes	4,000	.....	None	None	Op.
Fanto-Werke, Jozsef-ter 3-4, Budapest, 5	Bohumin	L. Fenyes	1,500	.....	None	None	Op.
Himmelbauer, Anton & Co., Moravska Ostrava	Moravska Ostrava	.....	500	S-W	None	None	Op.
Kralupska Raffinerie Mineralnich Oleju, Hybernska 44, Prague, 2	Kralupy	.....	750	S	None	None	Op.
Prara Hornovididlecka Raffinerie Petroleza Ehrenburg & Co., Strazske	Strazske	.....	100	.....	None	None	Op.
Privozer Mineraloelwerke, A.G. Nor., Moravska-Ostrava	Nor. Ostrava-Privoz	.....	1,250	.....	None	None	Op.
Sudkarpatische Mineralol Raffinerie und Handels, A.G., Mukacevo	Mukacevo	.....	100	.....	None	None	Op.
Vacuum Oil Co., S.A., Spalena 3, Prague	Kolin, Bohemia	.....	1,800	.....	None	None	Op.
Weinberger & Ortner, Doine Mihalany, Zemplin	Doine Mihalany	.....	100	.....	None	None	Op.
Total Czechoslovakia			12,300	.....	1,100		

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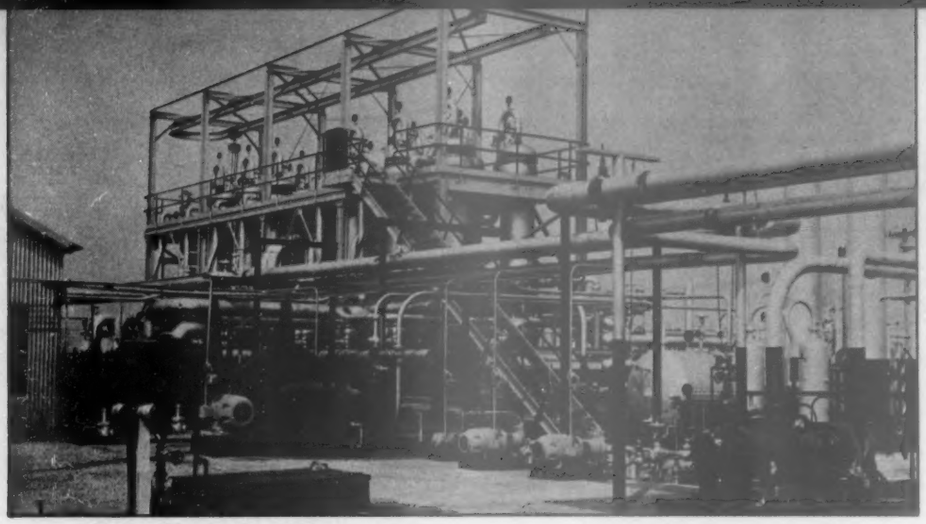
View of Y.P.F.'s La Plata (Buenos Aires) refinery



Large catalytic-cracking installation showing electric motors in foreground for circulating oil

War Gives Impetus to Refinery Expansion

By H. STANLEY NORMAN

WHILE the European war has stopped the construction work under way at several refineries located outside the United States, it is believed this development will be temporary. A large part of the refining capacity outside this country is not in the war area and it will be possible to continue shipments of construction materials and supplies to these plants. The war demands for petroleum on these plants are certain to be heavy, so there will be every incentive to maintain, or enlarge, present operations.

It is pointed out in this connection that the Allies will be in particular need of high-antiknock motor fuels, quality diesel fuels, and increased supplies of residual fuel oils. Several foreign plants have increased their capacity to produce these fuels through the installation of reforming, polymerization and additional cracking facilities. More units are to be built at other plants.

The war may be directly responsible for a new departure in the design and construction of European refineries. American equipment manufacturers are now sharing in supplying refining materials for a plant in Great Britain which will be entirely underground and adequately protected from air warfare. Unless some unforeseen disadvantage in this type of construction is revealed when the plant reaches the operating stage it is considered likely it will set a new pattern for building, although the additional expense will be weighed carefully against the risk of war.

The secrecy shrouding British defense activity is particularly tight around the new underground refinery. There are no insurmountable engineering obstacles visualized by American refinery technicians, although inclusion of protective measures against fire and for ventilation, together with the excavation, would add materially to the cost.

Reviewing 1939 refinery construction in Europe, major powers in January considered war inevitable and the next 9 months were devoted to every possible preparation. Building in France was confined to expanding facilities for production of aviation gasoline. The French refining industry had previously attained full stature in distillation capacity.

Crude-oil capacity of French refineries is 151,550 bbl. daily, exclusive of some small specialty plants. Cracking capacity in operation and under construction totals 72,900 bbl. per day, or 48 per cent of the crude-charging potential.

Two catalytic cracking units are in advanced stages of construction at Gravenchoin and Berre l'Etang and represent the most modern refining units in France, both designed under patents of the Houdry Process Corp. for the particular purpose of producing aviation motor fuel. Charging capacity of Raffineries de la Vacuum Oil Co. S.A.F.'s catalytic unit at Gravenchon varies from 2,200 to 3,200 bbl. per day, depending on whether operation is carried out with gas oil or naphtha. Raffinerie de Berre is building a catalytic cracking plant under the Houdry patents and design at Berre l'Etang with charging stock capacity of 4,535 to 6,375 bbl. per day. The Berre plant is to process gas oil or reduced crude, accounting for the range of capacity.

French construction would have involved greater emphasis on aviation motor-fuel facilities, including polymerization, alkylation, and catalytic reforming and desulfurization plants, but for the political unrest. This factor indicates an extensive backlog is being built up for construction contractors which will figure importantly in postwar months.

One of the largest refinery construction orders of recent years was placed late in 1938, but this project will carry into the middle of 1940. The refinery is that of Consolidated Refiners, Ltd., jointly owned by Anglo-Iranian Oil Co., Ltd., and Anglo-Saxon Petroleum Co., subsidiary of the Royal Dutch-Shell group. Preparation of the site was started late in 1938 but since the ground selected, adjacent to Haifa Bay on the east coast of Palestine, required an extensive drainage system and much grading, actual construction was not started until early in 1939.

The capacity of the refinery will be in the neighborhood of 40,000 bbl. daily. It has been rumored that Consolidated Refineries has decided to approximately double the original design since the war. Conventional combination topping and cracking units form the backbone of the new plant. Auxiliary units include two naphtha-reforming units and it is understood the sulfuric acid process of alkylation, developed partly by the concerns building the new Mediterranean refinery, is included. The plant, when completed, will produce a full range of light products, fuel oil and asphalt from Iraq crude.

The complete refinery will not be available for operation before the middle or latter part of 1930.

Linked with the Haifa refinery construction is the plan to increase the capacity of Iraq Pipe Line Co.'s system from the Kirkuk field to Haifa and Tripoli. However, the share of Iraq Petroleum Co., Ltd., production accruing to joint owners of the Consolidated Refineries will be sufficient to supply the Haifa plant temporarily, and will reduce the hazard of processing this quantity of oil in the belligerent zones of France and England.

A modern combination unit and two naphtha-reforming units were completed in France just before the war.

The 12,000-bbl. combination unit built by Cie. Francaise de Raffinage at Martigues was commissioned during the last half of the year and is in continuous operation.

Societe de Raffinage des Huiles de Petrole completed its 4,000-bbl. naphtha-reforming unit, now equipped to produce a full range of motor fuel and burning oils, including aviation gasoline. Two naphtha reformers, each with capacity of 15,000 bbl. per day, were completed and placed in operation during the year at the Abadan refinery of Anglo-Iranian Oil Co., Ltd., in Iran on the Persian Gulf. This addition at Abadan was only part of the work carried out during the year at this large refining center. Practically without exception, the new Abadan installations were designed to improve the quality of products derived from Iranian crude, with special emphasis on aviation motor fuel. Hostilities temporarily delayed plans for the new Anglo-Iranian refinery at Bandar Shapur, east of Abadan, where production from the new Gach Saran field will be delivered for processing. The Bandar Shapur refinery will be a complete unit and eventually may rival Abadan in size and importance, although present plans are more modest.

Bahrein Island Plant Enlarged

Development of commercial-scale production in Saudi Arabia and the forced temporary dependence on the Bahrein Petroleum Co.'s refinery for processing requirements has been instrumental in having additions made to the Bahrein Island plant. Since it was originally commissioned in 1936 the Bahrein refinery has been expanded twice, by installation of polymerization and distillation equipment. The refinery has a crude capacity of 32,500 bbl. per day and cracking facilities for handling 12,000 bbl. per day. Indications are additional capacity will be required on Bahrein Island or the construction of separate refining facilities on the Arabian mainland, if the exploratory program of California Arabian Standard Oil Co. over its extensive holdings continues to meet with success.

Although drilling has been restricted to modest exploratory proportions so far on the Burgan structure in Kuwait, the independent kingdom on the extreme northwest tip of the Persian Gulf, the three completed wells there give indication of an important crude reserve. Developments so far have not included facilities for entering the Kuwait production in the world market. Eventually, Anglo-Iranian and Gulf Oil Corp., joint partners in Kuwait Petroleum Co., will erect refining facilities near the new production or expand existing facilities elsewhere to absorb this new supply.

Development of deep production at approximately 7,500 to 7,800 ft. in the Dhulian field in the Punjab district of British India influenced Attock Oil Co. to expand and modernize its refinery at Rawalpindi this year. The modern plant has crude capacity of 4,000 bbl. per day and a cracking unit

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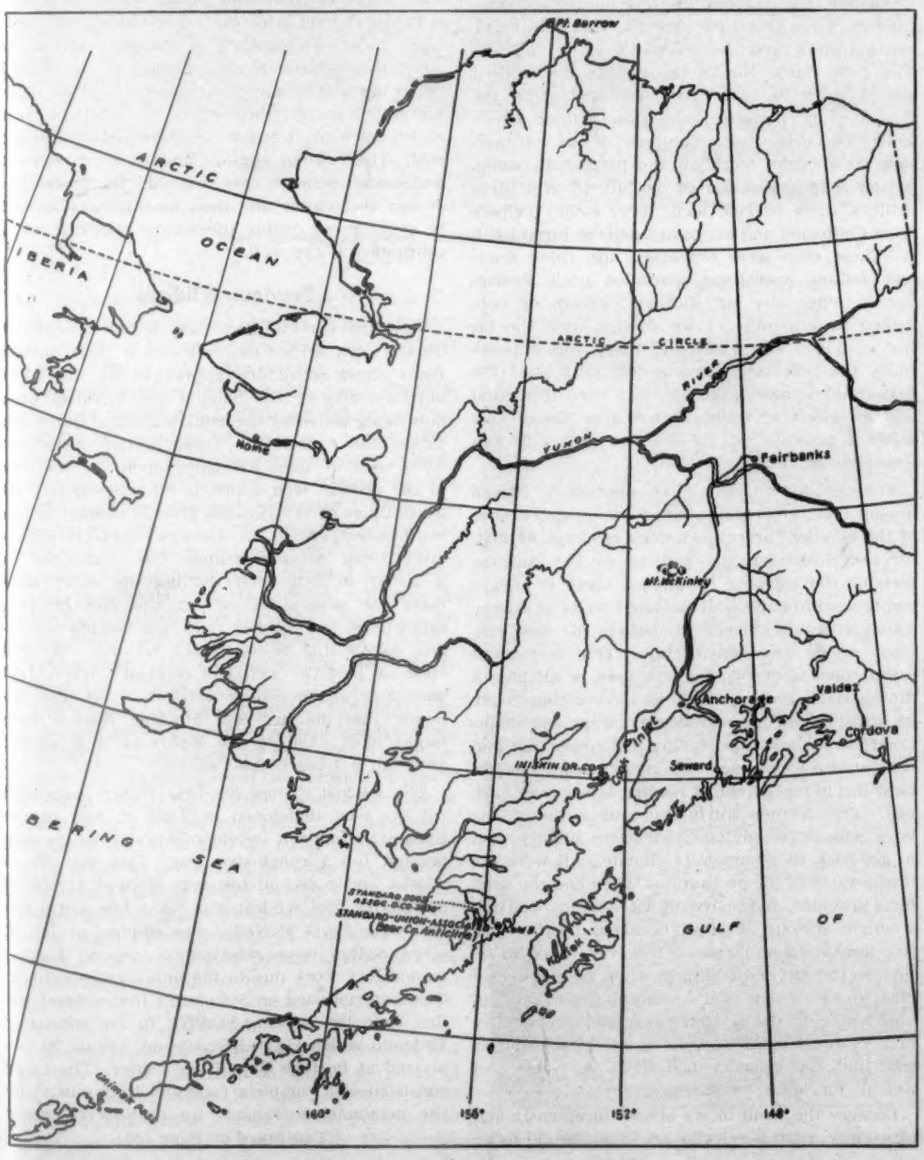
Alaskan Wildcat Nearing Critical Point in Depth

By L. P. STOCKMAN

One of winter's gestures. The Suaco blown ashore and iced down in a storm. The craft was refloated again at high tide when the ice was chopped off. Below, left: Map of Alaska, showing location of oil-exploration activity

THE joint wildcat of Standard Oil Co., Union Oil Co. and Tide Water Associated Oil Co. on approximately 135,000 acres of government land on the easterly side of the Alaskan Peninsula, across Shelikof Strait from Kodiak Island, has reached a depth of 6,390 ft. and consequently is nearing the critical point. Each of the three companies has an equal undivided one-third interest in the venture and although Standard Oil Co. is doing the drilling each contributes its prorata share of costs.

This wildcat, which has a protective string of 8⅝-in. casing cemented at 3,759 ft., was spudded in July 16, 1938, but was suspended during the 1938 winter. The crew returned to San Francisco December 12, 1938, and were granted an extended vacation. Four men, including the superintendent and radio operator, remained in the Happy Valley village during that winter and reported it would be entirely feasible to work at frequent intervals during the Alaskan winter. It was therefore decided that this year the crew would remain on the job until the well was completed or abandoned, remaining through the winter, if necessary. The crew returned to Jute Bay, Alaska, in April 1939, to resume drilling and at last reports were still going ahead in a hard formation. The well has shown considerable gas at times, but latest reports from the location indicate that no oil sand that would justify the expectation of securing commercial production had been logged.



The area undergoing exploratory work by the three companies has been divided into five major operating units, and agreements providing for the prospecting and development of each unit have been entered into between the operating companies and United States Government permittees. The agreements were approved by the secretary of the interior with the explicit understanding that drilling and production activities would be unified. This agreement is of special importance, because it indicates that the contracting companies have the option of drilling five prospect wells on four different structures embracing 135,000 acres if they desire to do so. The present test now being drilled will decide, in all probability, whether any further exploratory work will be undertaken, because if this well proves unproductive, additional drilling would not be justified. The Salmon Creek structure shows most promise and the failure here would indicate that geological conditions in general are unfavorable.

The general scene of operation is in the Kanatak district where geological exploration revealed a likely structure in the Salmon Creek Valley, about 4 miles inland from Jute Bay. The structure being tested comprises approximately 20,000 acres and consists of a well-defined anticline. The structure has a moderate elevation of approximately 2,000 ft. and the area is easily accessible, although because of interruptions from climatic causes it required 9 weeks to effect a safe landing and build the necessary roads, transport materials from the beach to the location, rig up derrick, provide tankage and complete other necessary preliminary work. A williwaw, that violent and unpredictable wind that sweeps down off the snowy slopes to disrupt shipping in this part of Alaska, isolated the first shore party for several days and retarded unloading, and a short time later another williwaw, accompanied by snow,

Left: Camp buildings at No. 1 Grammer well, picturesquely located. Below: Unloading material from barge, using crane, at Jute

tipped over two loaded barges and dumped 150 tons of material in 30 ft. of water.

Preliminary Work

Considerable preliminary work was necessary before this wildcat was started as everything had to be prepared in advance. Standard's general engineering department studied local conditions, planned the facilities to fit, charted and mapped everything, laid out the camp on paper, designed the prefabricated buildings, and listed and ordered all necessary materials. The transportation department chartered the steamship North Wind, arranged for concentration of materials at three points, Seattle, San Francisco and San Pedro, and supervised the loading and departure of the ship. Standard's telephone section of the pipe-line department selected the short-wave radio equipment, obtained permits for establishing a radio station at Jute Bay and for using radio aboard the boat Suaco. The motor transport department selected the special off-road vehicles, a truck, a car, two tractors, trailers and a crane. The medical division examined all employes before they sailed and chose a doctor for the camp.

On January 30, 1938, with all preliminary plans completed, an advance party sailed from Seattle to pick the site for the beach camp and prepare for the landing of some 4,000 tons of material, equipment and supplies to follow aboard the steamship North Wind. Their craft was a reconditioned, reequipped and rechristened purse-seiner, the Suaco, a name coined from the initials of the three participating companies. The voyage was stormy, particularly off Cape St. Elias where it was a constant battle with ice. Weather forecasts were obtained from the Signal Corps, Coast Guard and other local agencies before making a run from one protected harbor to the next. For this reason the voyage required 19 days to Kodiak, and, instead of arriving well ahead of the North Wind, the advance party was only a few days ahead. In that time, however, the crew of the Suaco had arranged at Kodiak for local labor, and secured two barges for lightering supplies ashore. After being storm-bound for 3 days they crossed Shelikof Strait where they joined the North Wind, which had arrived and anchored in Wide Bay, 14 miles up the coast from Jute Bay.

Unloading operations were started immediately and material was moved from ship to barge and then to the beach. Aboard the North Wind was everything needed to house and feed 60 men, construct a road, build a permanent camp, set up shops and communicating systems, erect a steel derrick, provide power and equipment for drilling, all carefully stowed for the proper sequence of unloading. Among the items taken along were 4,000 bbl. of oil, 100 tons of coal, 50 tons of cement, 1,100 tons of drilling equipment, 60 tons of machinery, 160 tons of camp supplies, 15 tons of food, 30 tons of small tools and 350,000 f.b.m. of lumber. Cranes, timber, lumber, tractors and the necessities for the temporary beach camp came out of the ship first. And then the williwaw mentioned swept down on the camp and disrupted operations for several days. It required almost a month to unload the North Wind, due to frequent storms and the necessity of beaching the equipment at the proper stage of the tide.

Opening the road through hills and across boggy country was a tough job owing to incessant rains, melting snow and the character of the terrain. The first tractor broke through to the drilling site on April 19, 1938, and the following day the first load of material landed in Salmon Creek Valley and the advance members of the construction crew began work on the permanent camp. Actual drilling was started on July 16 with three drillers, three derrick men, three rotary helpers from California and six rotary helpers hired locally. These men were organized into three tours and drilling operations continued until November 15 when the log showed 2,300 ft. of hole drilled in 4 months. Prior to this time the bit had run into salt water and there was a possibility the hole could not be left until the 1939 season. Fortunately the bit hit a hard formation and an effective water shutoff was made. This made it possible for the crew to return to San Francisco in December, 1938.

The decision to remain on the job in Alaska during the forthcoming winter was made because of the excellent accommodations available no matter how inclement the weather or how uncomfortable the working conditions, there is always comfort within the well-insulated walls of Happy Valley village, a permanent camp of the most efficient design and construction. This permanent camp consists of two bunk houses, a kitchen, a dining room seating 60 men, a recreation room, an office building, a warehouse, garage and shops. Comforts include inner-spring mattresses, hot and cold showers, a modern laundry room, electric light including individual reading lamps over each bed. This sounds intriguing, but some of the boys who came out last year were mighty glad to get back to a temperate climate. All were enthusiastic over the precautions taken and the comforts provided, and above all, were happy that not a single serious accident occurred on the job. One local Alaskan employe, however, failed to return to the job one midnight when he was scheduled to go on tour and a searching party found him frozen to death. This was the only fatality in 2 years of work and the irony of the matter was that the casualty had lived in Nome and Kodiak for many years.

Because the wind blows almost incessantly and constantly, with a velocity up to 60 and 70 miles an hour, the roofs of all buildings have no eaves for the gale to get hold of, and to protect against the severe cold the walls are extremely well insulated. All buildings are securely guyed and the reinforced 136-ft. steel derrick used on the job is anchored in place with 24 steel cables. The 100-watt telephone and code radio station kept the camp in contact with the outer world, and messages were sent regularly to the home office, relayed through the Kodiak station of the Signal Corps. It is interesting to note also that all drilling equipment on the well is housed in with a well-constructed wooden structure with a sloping roof. The drilling engines and other equipment are located beneath this structure for protection during the winter and thus no difficulty should be experienced during the winter provided work continues on the well.

Previous Wildcats

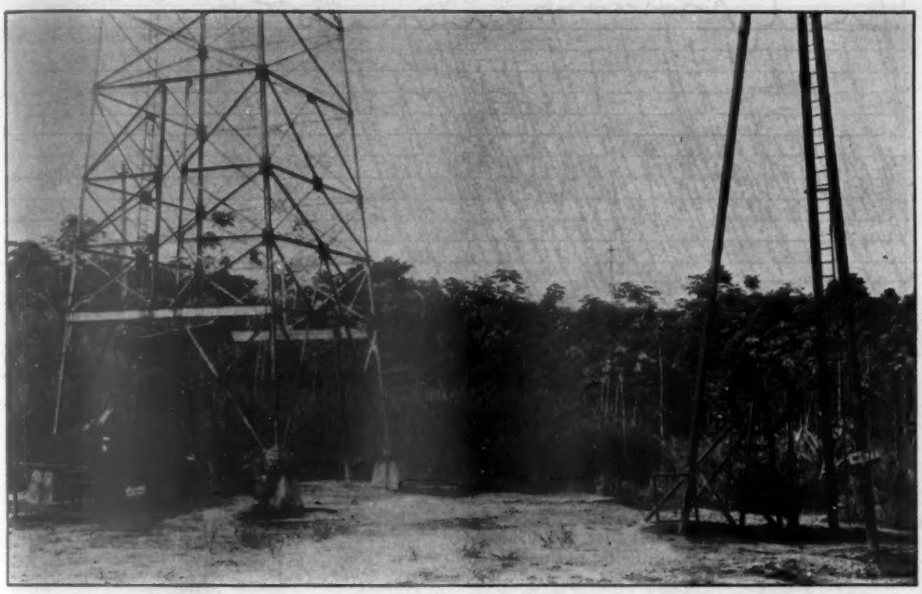
Standard Oil Co. and Tide Water Associated Oil Co. each drilled two wildcats in 1922 on the Pearl Creek structure approximately 25 miles northwesterly of the Salmon Creek Valley area now being tested by the joint wildcat of Standard, Union and Associated. These earlier operations have been of some influence upon the location of the present well which is intended to test oil possibilities of the Jurassic-Triassic contact in the southeastern end of the Alaskan Peninsula. Standard's initial Alaskan wildcat was abandoned as a duster in 1926 after drilling the short summers for several years. At the end of 1923 this wildcat had reached 1,075 ft. following numerous delays due to inclement weather. At the close of 1924 the well had reached 3,017 ft. and was later abandoned at 5,003 ft. It is now believed that another few hundred feet of hole might have changed the status of this wildcat as it did not reach the Triassic.

The wildcat drilled by Tide Water Associated Oil Co. was abandoned at 3,030 ft. and in the light of subsequent developments did not go deep enough for a conclusive test. This was No. 1 Alaska and a second test was stopped at 560 ft. Standard's first wildcat was No. 1 Lee and a second well, No. 1 McNally, was stopped at 700 ft. when orders were received to suspend further exploratory work due to the unfavorable outlook. The material used on Standard's first wildcat left San Francisco in August 1922, in the steamship Redondo which cleared Seattle on August 20 and arrived at Portage Bay 10 days later. The cargo consisted of a complete rotary drilling outfit and the personnel was made up of Superintendent

(Continued on Page 110)

Colombian Plant Uses Electric Power Extensively

By MAX CRAWFORD and H. W. PALKOWSKY
Tropical Oil Co., Colombia



View showing back-crank installation in North Infantas field

A DISTINCTIVE feature of the Tropical Oil Co.'s operations in Colombia is the extensive use of electric power for practically all plant and field operations other than drilling.

Originally, the main generating plant which is located in the field at El Centro consisted of four 1,000-kw. noncondensing turbines. A few years later the plant was enlarged to a capacity of 8,000 kw. by adding to three of the original units a 5,000-kw. condensing turbogenerator. Since that time operation of the noncondensing turbines has been confined to intermittent service; i.e., for occasional peak loads and during periodical inspections of the large unit. A single 1,000-kw. unit was installed at the refinery at Barranca-Bermeja, which is approximately 20 miles distant from the field, and frequently the two generating stations are operated in parallel.

The present boiler installation at El Centro comprises seven 500-hp. gas-fired boilers which operate at 225-lb. steam pressure. By the addition of superheaters and the enlarging of the furnaces by means of Dutch ovens, the boilers are now capable of operating at a 175 per cent rating. While most of the steam output is used for electric-power generation, about 40 per cent is consumed in other requirements, the principal one being the main natural-gasoline plant which is situated near the power plant. The advantage of centralizing operations when conditioning permit is obvious from an operating-cost standpoint.

Distribution

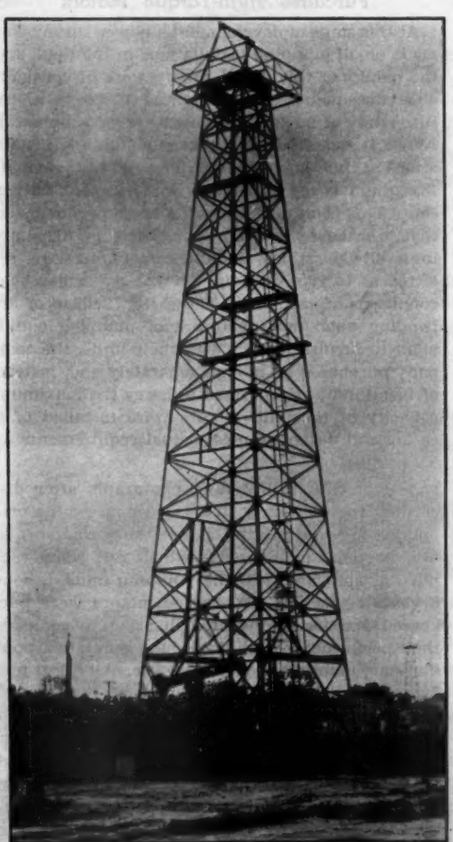
Electric power is generated at 2,300 volts, and primary current distribution within a radius of 3 km. is also carried at 2,300 volts, while at greater distances 13,200 volts is used. At the present time there are four 13,200-volt circuits in the system which are designed for a capacity of 1,000 kva. Secondary current distribution throughout the field is at 440 volts from field transformer stations which are situated so as to provide service areas of approximately 1 sq. km. per station. At the present range of field development there are 70 transformer stations ranging in capacity from 50 to 225 kva. (all three phase), depending upon the number of wells and oil-gathering stations located in the particular service area. The transmission system now also comprises a total of 300 km. of lines having the following distribution:

	Kilometers
13,200 volts	82
2,300 volts	30
440 volts	188

A particular development within the last few years as regards transmission has been the installation of capacitor groups in selected areas for purposes of power-factor correction. Logically, of course, the place to correct a low power factor is at the source of the cause, which is usually faulty motor application. This phase of the problem in its local application will be discussed later. On the other hand, where the 440-volt services are unusually numerous and transient in capacity requirements, as in most oil fields, the capacitor or static condenser constitutes a very useful adjunct in the transmission system.

Probably the most important consideration in any problem of power distribution is the one of service continuity. In the case of an electrical system, power outage records afford not only excellent criteria as to the service factor, but likewise as a means of study for reducing or eliminating interruptions. For more than 10 years the Tropical has maintained a constant and complete record of power outages. During the year 1938 there were something like 230 individual instances of power interruption, most of which were of short duration or involved only small or isolated sections of the system. Although, in detail, the causes are many and varied, they may be summarized under the general headings of construction, alterations, maintenance, and flashover or breakdowns. We believe it noteworthy that during 1938 the load lost due to power outages for all causes amounted to only 0.1 per cent of the total net kilowatt-hours generated. Even this figure is appreciably higher than for the previous year because of the exceptionally long rainy season accompanied by electrical storms which occurred in 1938.

Practically one-half of the total outages are caused by flashovers and breakdowns, which in turn are due chiefly to severe electrical storms, a characteristic of the region along the Magdalena Valley. Although there is no evidence of a direct stroke of lightning ever having occurred on the electrical systems, nevertheless frequently strong voltage surges are induced by lightning. Since these surges are difficult to control, line insulators, feeder terminals, and even lightning arresters are occasionally taxed to their limit of stress because of overvoltages. Various measures have been tried



View showing pumping-well installation in La Cira field

and are being used to overcome this difficulty, although admittedly none of these offers a complete solution of the problem. In the case of the 2,300-volt circuits these are shielded to a considerable extent by installing 13,200-volt circuits at the top of the same pole line. In other cases, oil circuit breakers with automatic reclosing features are installed in strategic locations which improve the maintenance of service in these areas. Also air circuit breakers, metering equipment, and large transformer stations are protected by locating lightning arresters as close as possible to these vulnerable points.

Pumping-Well Motors

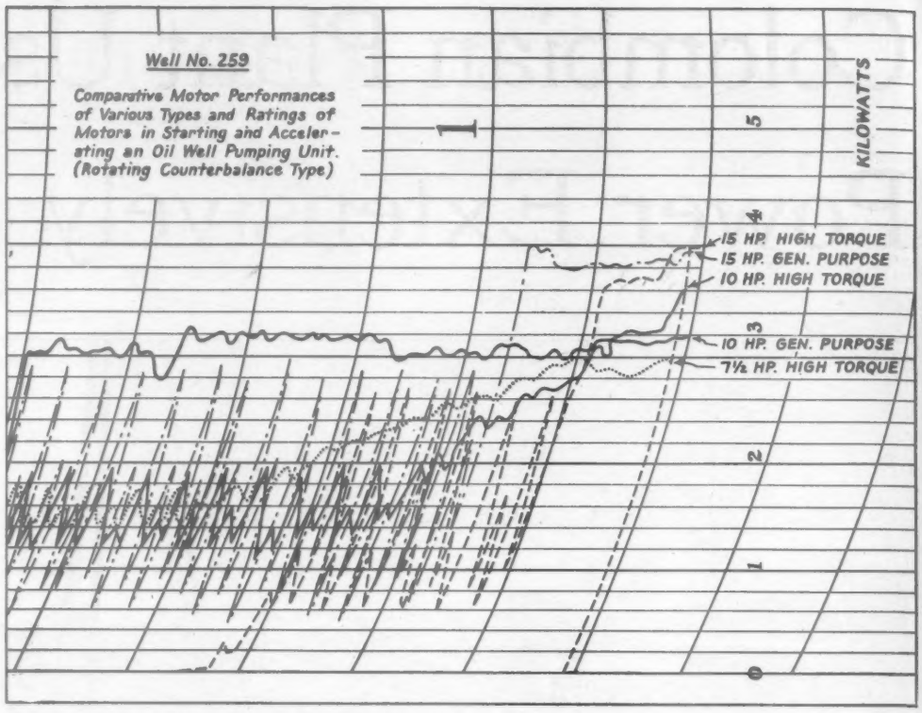
As stated previously, electric power has a wide scope of application in this field, including refining, natural-gasoline plants, all producing operations, machine shops and, of course, domestic use. Almost 60 per cent of the total power generated is allocated to production activities such as pumping wells, gathering stations, and well servicing, and 75 per cent of this portion is consumed by pumping wells. This particular application of electric power is then the most important as well as the most interesting phase of the entire problem.

Approximately 80 per cent of the total field production is obtained by pumping, and there are more than 650 pumping wells in the field at this time. The average well depth is roughly 2,600 ft., but the individual wells range from 400 to 4,000 ft. in depth. With the exception of two central pumping powers, the wells are equipped with individual pumping units. The extremely broken terrain and the heavy undergrowth are not conducive to central power pumping. Due to the wide range in well depth and load conditions, pumping equipment of various capacities is operated in the field. It may be of general interest to review briefly the gradual development which led to selection of the present type of electric motors being used in this field.

Ten or twelve years ago when the first well-pumping motors were obtained for the field, the

Pumping from a depth of 2,600 ft. with a 1-hp. motor

available type of pumping equipment was the "standard front," an adaptation of the cable-tool drilling rig. As this equipment was used for both pumping and servicing, dual-rated motors of 15-35 hp. were installed. As generally known now, this is a highly inefficient type of motor from a power-consumption standpoint. Later, when manufacturers of pumping units improved their design, more compact and more efficient pumping equipment was obtained, and likewise portable hoists



were placed in use. The change in pumping-unit design permitted the discarding of the dual-rated motors and replacing these with normal-torque 900-r.p.m. general-purpose motors. At this time manufacturers were being asked to furnish motors with their pumping units, with the result that the motors supplied were of a size that could handle the rated capacity of the unit. In most cases it developed that these were much larger than the actual operating requirements.

Purchase High-Torque Motors

At this stage of development a power survey was made on all pumping installations in the field, and the results of this initial survey were of considerable consequence to the Tropical Oil Co. in its future study of power problems as regards pumping wells. It was discovered that our pumping installations at this time were overpowered to the extent that the average load factor was less than 50 per cent. This condition led to the obvious conclusion that in order to realize power efficiency in pumping well operations, driving motors must be selected as to type and size for the particular load conditions of each well. Thereafter, instead of depending upon manufacturers of pumping equipment to furnish motors with their units, the company purchased its motors separately and, instead of installing a motor rated to carry the maximum capacity of the unit, motors were installed of a rating and design to meet actual requirements as determined by load tests.

As stated in a preceding paragraph, after discarding the inefficient dual-rated motors, the predominating oil-field type became the normal-torque low starting-current motor which was being supplied as standard with the pumping units. About 6 years ago a few high-torque motors were purchased and tests conducted in order to compare their performance with that of the general-purpose line-start motors already in service. A typical test was that made on well No. 259, where the average load indicated a requirement of 10 hp., although a 15-hp. normal-torque motor was actually in operation there at the time. The following tabulated data, together with graph, will illustrate best the comparative results obtained and clearly indicate the superiority of the high-torque motor over the general-purpose type for this particular kind of service.

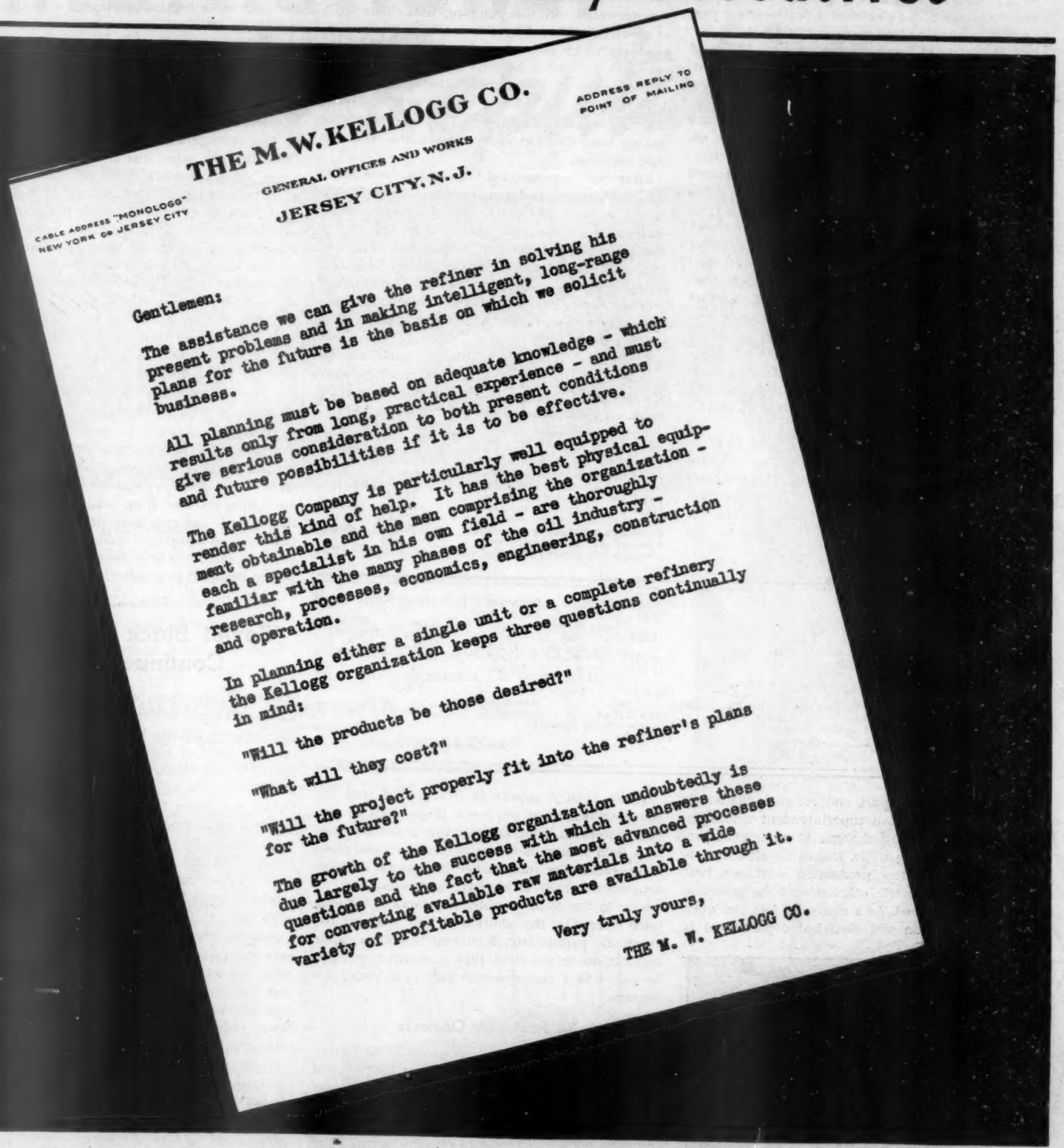
	15 hp. general purpose	15 hp. high torque	10 hp. general purpose	10 hp. high torque	7½ hp. high torque
Kilowatt input	8.0	8.20	....	8.0	7.80
Kilovolt-ampere input	10.40	10.60	....	9.62	9.80
Power factor	0.77	0.755	....	0.835	9.795
Curren rating, per cent	67.0	71.0	....	93.0	119.0
Rated load, per cent	61.0	63.0	....	92.0	120.0
Starting peak, kw.	20.0	20.0	17.0	18.0	15.0
Acceleration, kw.	20.0	18.0	17.0	13.0	13.0
Starting time, sec.	18.0	7.0	Stalled	15.0	33.0

The accompanying graph, a reproduction taken from a recording wattmeter, illustrates particularly the superior starting characteristics of the high-torque motor, which is a highly desirable feature in pumping-well operation. In this specific instance it was necessary to "rock" the counterweight on the pumping unit in order that a 15-hp. general-purpose motor could start the load and a 10-hp. motor of the same type was completely stalled. On the other hand a 7½-hp. high-torque motor was able to accelerate the load and continue operating although it was approximately 20 per cent overloaded. Obviously, the size of motor best suitable and recommended for the specific load conditions was a 10-hp. high-torque motor. From many other similar tests it became evident that for well pumping normal-torque motors could be replaced not only with high-torque motors of a lower rating, but what is more important with an appreciable saving of electric power as well.

While in the above test there did not appear to be any difference in the kilowatt input, actually, in most cases of replacement, there is a decrease in the kilowatt consumption in favor of the smaller high-torque motor. In addition, however, to the actual decrease in kilowatt consumption at individual wells, there is a cumulative saving which extends through the entire distribution system and to the generating plant itself. Through the reduction of kilovolt-amperes in motor loadings, with resulting improved power factor, there is a correspondingly decreased load on service lines, transformer stations, and finally on the generators at the power plant.

It is no doubt appreciated that because of such factors as production decline, water encroachment, gas-oil ratio control, and various other causes, there

A Letter to Refinery Executives



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is almost a constant change in load conditions at individual wells. With the aim in view of affecting the greatest possible economy in power consumption, a separate engineering division was set up a few years ago in the electrical department for purpose of conducting load tests on motors of the several hundred-odd pumping installations. The field work involved has been placed on a definite schedule and now constitutes an important operating routine.

The necessary instruments used in taking the load tests consist of a graphic wattmeter with adjustable chart speed, a voltmeter, and an integrating watt-hour meter, all of which are contained in a single assembly. The watt-hour meter has a double-throw switch connected in such a manner that by throwing the switch to the right-hand position the number of revolutions per second of meter disk is obtained, and from this the kilowatt load is computed. Reactive kilovolt-amperes are computed from data obtained in like manner but with the double-throw switch in the left-hand position. The graphic watt-meter is used to determine the starting characteristics of the load and the balance of the pumping unit. In order to attain the load ratio desired, it is important that the pumping unit be as nearly balanced as possible. The voltage is also checked with each test.

The following is a facsimile of a "load test" report, and resulting recommendation as to motor change and counterbalance check. In the field this form is printed in Spanish for the use of Colombian workmen who have been trained to obtain the test data. Computation is done in the office by the testing-division engineer.

very closely coordinated at all times. If no adjustments as regards pumping speed, rod travel, or working-barrel size are found necessary the production foreman first proceeds to check the counterweight on the pumping unit. This work is greatly facilitated by the use of a clip-on type ammeter which is connected to one of the lead-in cables at the switch box. By observing the travel of the needle on the ammeter the relative unbalance between the rod and counterweight strokes may be readily ascertained. The counterbalance having been checked and adjusted, the motor is then replaced.

After the recommended change has been made the load is rechecked and a similar report is submitted on the newly installed motor. In the above example the subsequent load data on the 7½-hp. motor which replaced the 15-hp. motor was 3.69 kw., 5.10 kva., and 0.725 power factor. This is a decrease of 0.36 in kw. input and 2.25 in kva. The greatest improvement, however, took place in the operating power factor which was raised from 0.552 to 0.725.

Some idea of the extent of this work may be gained from the following tabulation which summarizes the changes effected in one year's time, based on recommendations from the load tests:

		Net change
Number of motors relocated	193	.....
Total hp. of motors removed	2,080	.....
Total hp. of motors installed	1,377½	—702 ½
Total kw. of motors removed	737.6	.....
Total kw. of motors installed	696.6	—41.0
Total kva. of motors removed	1,270.8	.....
Total kva. of motors installed	1,009.5	—261.7
Average p.f. motors removed	0.58	.....
Average p.f. motors installed	0.69	+0.11

To dept. (Production) Date (7-29-39) Location (Well 1007)
Type unit (No. 4-11) S.p.m. (19.0) Motor No. (4114)

Switch to the right	Revolutions of disk	(3)		Make		Type	(FT)
	Time in seconds	(64)	Kw. (4.05)	Hp.	(15)	Serial	(5286131)
Switch to the left	Revolutions of disk	(3)		R.p.m.	(1,200)	Volts	(440)
	Time in seconds	(37.6)	Rkva. (6.13)	Amp.	(19.5)	Kva.	(14.9)
	Volts	(456)	Kva. (7.35)	P.f.	(55.2)		

RELAY

Start peak (31) Kw. Run peak (12.2) Kw. Make (TA-5)
% full load amp. (49.3) % % actual capacity (30) % Heater amperes (23.0)
Recommendation (Replace with 7½-hp. 1,200-r.p.m. Type KG or CS-2 [high torque] motor: Underloaded. Check balance—Rods heavy.) Setting (100%)
Tested by

Electrical Department

A copy of this report and recommendation is sent to the production superintendent whose department effects any changes of equipment pertaining to pumping wells. Before an alteration is made, however, the production engineer first checks the volumetric efficiency of the pumping equipment involved. As a matter of fact the work of the production and electrical departments is

Pumping installation, well depth 2,900 ft. Motor is 3-hp.

While it may appear at first glance that the above system must require a large stock of surplus motors on hand, actually this is not the case. In a field where there are several hundred wells in operation the interchange of motors involves equipment which is already in service. The increase in the total number of motors is necessitated chiefly by the addition of new wells on the pump. By maintaining a current check on motor applications in the field, future requirements can be gaged to a closer degree and to a better advantage.

No Particular Obstacle

The amount of work involved offers no particular obstacle provided this is systematized and followed according to a definite routine. On new installations where the producing capacity of the well is in doubt, the pumping unit is first equipped with a motor large enough to carry the rated output of the machine. When the production capacity has been determined and sufficient time elapsed for the well to settle down to its normal rate, a load test is made to determine the correct size of motor required. To facilitate motor changes all pumping-well motors are equipped with water-tight plug receptacles and the motor ends of the lead cables with water-tight plugs. The plugs and receptacles are all polarized so that units will not be reversed when motors are exchanged. By this provision motor replacements are effected in approximately ½ hour. As a working criterion for the field it is considered good practice to have at least 75 per cent of the pumping wells currently equipped with correct motor installations. The term correct is used here to mean that the motor should be operated at 80 per cent of its full load rating, at which point the maximum efficiency is obtained with a squirrel-cage motor.

Power Factor Raised

One of the tangible values resulting from the load-testing procedure is indicated in the trend of the average kilowatt input per well for the field. In 1932, when the first power survey was made, there were 263 pumping wells in the field with an average kilowatt input per well of 4.02. Two years later, with 352 wells pumping, the figure decreased to 3.97, while at the present time there are approximately 650 wells on the beam with an average input of 3.33 kw. per well. What is more important, however, from the standpoint of the entire system the operating power factor was raised from 0.552 to 0.725. It is also significant that during the last few years new wells placed on the beam have been, due to their location on the structure, consistently heavier than the average for the field both from a standpoint of depth as well as daily yield.

In closing, it might be mentioned that studies are now also being made of other phases of pumping-well efficiencies which, while closely related to the general problem of power utilization, are quite distinct from that of motor application. These features deal chiefly with lifting efficiencies of equipment under varying conditions and the factors which determine the amount of power required per barrel of oil lifted.

Soviet Black Sea Exports Continue to Drop

SOVIET petroleum exports through the Black Sea dropped to 27,930 tons in September (approximately 195,000 bbl.), according to a check on manifests of ships passing Istanbul and reported to this country by United States commercial attaches in Turkey. The September exports of Soviet petroleum through Istanbul represent the smallest total reported in recent years and probably reflect the diversion of normal shipments to the northern part of the country for service in the Polish campaign and for concentration of stocks near the base of operations against Finland.

For the first 9 months of this year U.S.S.R. petroleum exports through Istanbul, which is the main sea route open to that country's oil fields and refineries, totaled 499,573 tons, or about 3,500,000 bbl. For the first 9 months of 1938, Soviet petroleum exports through Black Sea ports totaled 604,140 tons, or about 4,230,000 bbl.

Gasoline made up 11,618 tons of the September petroleum exports and heavy fuel-oil shipments totaled 10,394 tons. Kerosene was the only other product exported in September and shipments aggregated 5,918 tons. All but 498 tons of the September gasoline movement past Istanbul, or a total of 11,120 tons, moved to Siberia where the Soviets have been augmenting domestic supplies with purchases on the Pacific Coast of the United States for nearly a year.

September petroleum exports from the U.S.S.R. by products and destinations follow (figures in metric tons):

Destination—	Fuel oil	Gasoline	Kerosene	Total
Estonia	.....	.....	5,918	5,918
Italy	6,852	.....	.....	6,852
Latvia	3,542	498	.....	4,040
Siberia	.....	11,120	.....	11,120
Total	10,394	11,618	5,918	27,930

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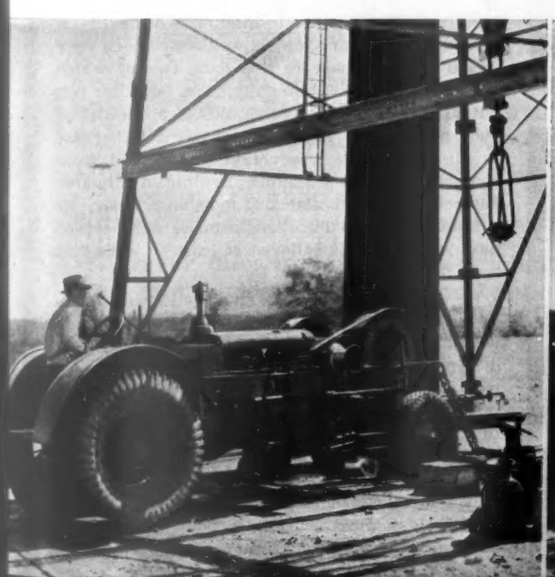
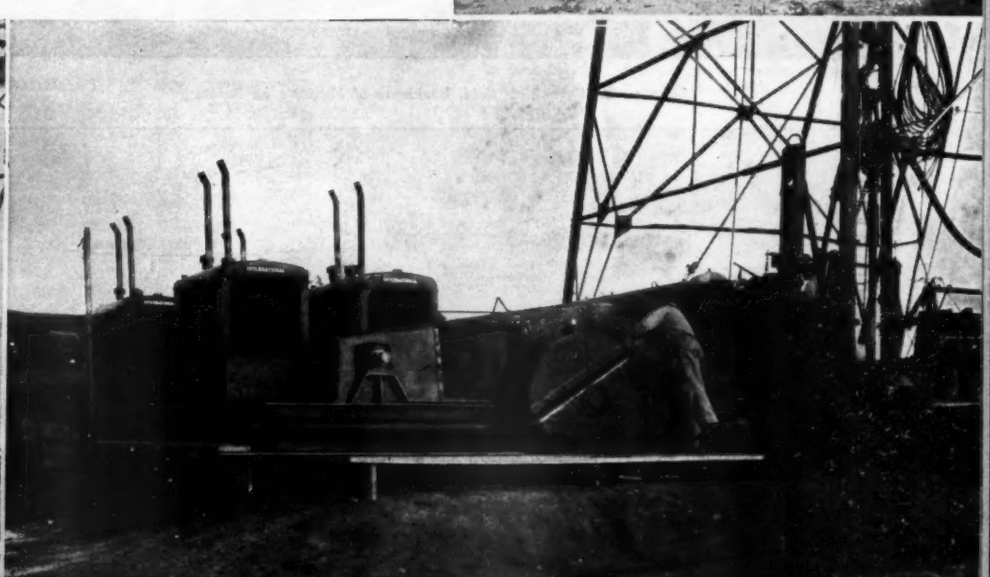
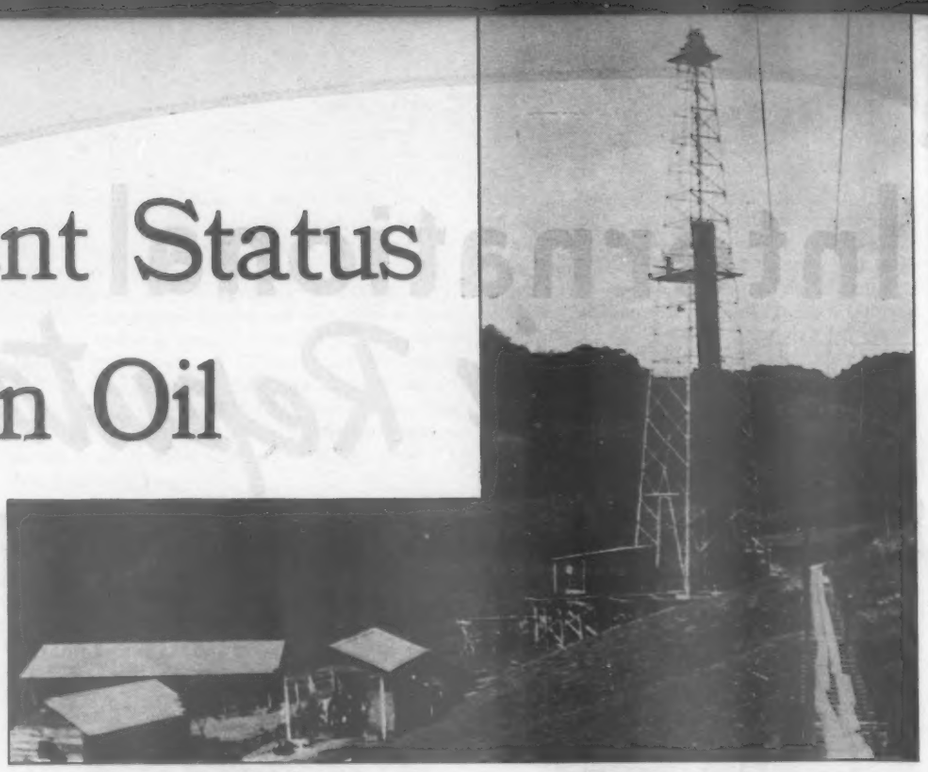




The Present Status of Mexican Oil

Most of the properties of private oil companies in Mexico were expropriated March 18, 1938. These operations have since been consolidated under the name of Petroleos Mexicanos with the management in the hands of those appointed by the Mexican Government. The accompanying articles describe the present status of producing and refining operations. The material was made available through courtesy of Ing. Vicente Cortes Herrera, general manager Petroleos Mexicanos.



Ojital and Potrero No. 1, a wildcat near Papantla, Vera Cruz

Air view of Poza Rica field, backbone of Mexico's oil industry

Above is seen a partial view of Poza Rica field, while the view below is of an absorption plant in the field

"PETROLEOS MEXICANOS" continues to operate normally. Production of crude during the months of January to September of 1939 was 30,313,561 bbl. which compared with 26,291,848 bbl., for the same period of the previous year, shows an increase of 15 per cent.

Exploration work has been increased during the present year, having several geologists distributed in the petroleum zones on the Gulf Coast. Geophysical exploration has received special attention. Two seismograph crews are active, one in the State of Vera Cruz and one in the State of Tabasco and magnetometer party is active in the region of Posa Rica. Gravimetric work will soon be started. Aerial surveys covering approximately 2,100 sq. km. have been made.

Drilling

"Petroleos Mexicanos" is not drilling any wildcat wells at present, but it is believed that at least five will be drilled in the course of next year.

In the Tampico region six wells have been completed from January to this date, two of which are producing 1,600 bbl. daily. The fact that two out of six wells were producers is apparently a poor percentage. This, however, is not the case in an area where production is obtained from compact-fractured limestone. Drilling in this area has been done with standard tools with three rigs active at present. Two light rotaries will be used next year and it is believed at least 40 wells will be completed.

In the Poza Rica field five wells were completed during this year, all of them producers, with a capacity of 35,000 bbl. daily and one now drilling will be brought in shortly. Four rotary rigs have been active up to the present, but this number will be increased in the future to be able to complete 15 wells next year.

In the Isthmus of Tehuantepec zone seven wells have been completed in the course of this year, only one of which came in dry; all of them in the El Plan field, with a production of 6,400 bbl. daily. Three rotary rigs are actually active.

Beside increasing the drilling program in the fields of the Isthmus, the Cuichapa field will be put on production and development, as it had four producing wells without outlet for its production in the past, but a 15,000-bbl. daily pipe line has been connected recently to take care of future production in this field.

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The Poza Rica-Mexico City pipe line will be conditioned to increase its capacity to 22,500 bbl. daily. A pump was installed at Kilometer 32 on the pipe line between Poza Rica and the loading terminal at Tuxpam on the coast to allow the exploitation of that field up to 100,000 bbl. daily. Work is well on the way to build a road between Alamo and Poza Rica, and a 12-in. pipe line between these two fields has been started. As soon as this new pipe line is completed it will allow, in connection with the others, an outlet for 200,000 bbl. daily from this latter field.

The use of waste Poza Rica gas in Mexico City is a project which will probably see its realization during next year. In connection with this, the first steps have been taken to lay a 20-in. pipe line with a capacity of 35,000,000 cu. ft. daily.

As stated previously, a 8-in. pipe line was laid to connect the Cuichapa field with the El Chapo-El Plan pipe line, 5 km. long and with a capacity of 15,000 bbl. daily.

The gas-compressor plant at El Plan will see its power increased to 4,500 hp. and its capacity to 25,000,000 cu. ft. daily before this year is over. Thirty-six wells of the Tonala field will be changed from gas lift to the pump.

In the Poza Rica field a battery of separators with individual capacity of 10,000 bbl. is practically finished, located in that section of the field where drilling is most intense.

In the loading-terminal station at Tuxpam where exportation is most active, two 8-in. submarine pipe lines were laid to facilitate oil-tanker loading.

Five Refineries Being Operated

PETROLEOS MEXICANOS is at present operating five refineries. Previous to the expropriation of March 18, 1939, one was operated by the Huasteca Petroleum Co., subsidiary of the Standard Oil Co. of New Jersey; one by the Sinclair Pierce Oil Co., S.A., as a Sinclair subsidiary; and three by the Cia. Mexicana de Petroleo "El Aguila," S.A., a Shell subsidiary.

The Huasteca refinery at Mata Redonda, Vera Cruz, consisted of a very old distillation unit, which, during the 6 months previous to the expropriation, averaged a throughput of less than 8,000 bbl. per day, and a Kellogg cracking unit operating on about 7,000 bbl. per day of topped crude. The Kellogg unit was about 6 years old at the time of the expropriation and was the most modern of the cracking units operated by the companies. This Kellogg cracking plant is still operating satisfactorily and during the last 6 months the average throughput was nearly the same as during the 6 months previous to the expropriation. The actual figures for the first 6 months were 5,667 bbl. per day, and the figures for the last 6-month average were 5,394 bbl. per day.

With regard to the primary distillation unit mentioned above, it has been substantially repaired and throughput has been increased, the figures being daily average for the 6 months prior to the expropriation 6,793 bbl., and daily average for the last 6 months 7,432 bbl.

The refinery of the Pierce Oil Co. did not have any cracking equipment, but had three small atmospheric distillation units, of which two were of 4,000-bbl. capacity and one of 6,500-bbl. capacity. Of these three units, one had just been completed prior to the expropriation, one was 2 years old at that time, and the third was a very old plant originally constructed of second-hand equipment. Since the expropriation, the old plant has been thoroughly repaired and the result is that the throughput in this refinery is actually considerably higher than the average throughput for the 6 months previous to the expropriation; but this naturally is due to the third unit which had just been completed.

The three remaining refineries, which were operated by the Shell subsidiary known as the Cia. Mexicana de Petroleo "El Aguila," S.A., consisted of the following:

(*a*) A Tampico refinery operating on 50,000 bbl of crude with a Gyro cracking unit of capacity 7,000 bbl. of topped crude, and a Dubbs reformer of 5,000-bbl. capacity.

(*b*) A Minatitlan refinery with 30,000-bbl. crude capacity, and a Dubbs cracking plant with capacity for 2,500 bbl. of gas oil.

(*c*) A Mexico City refinery with capacity of 15,000 bbl. of crude, without any cracking or reforming facilities.

The Mexico refinery has operated at full capacity ever since the expropriation, its average throughput being around 15,000 bbl. per day.

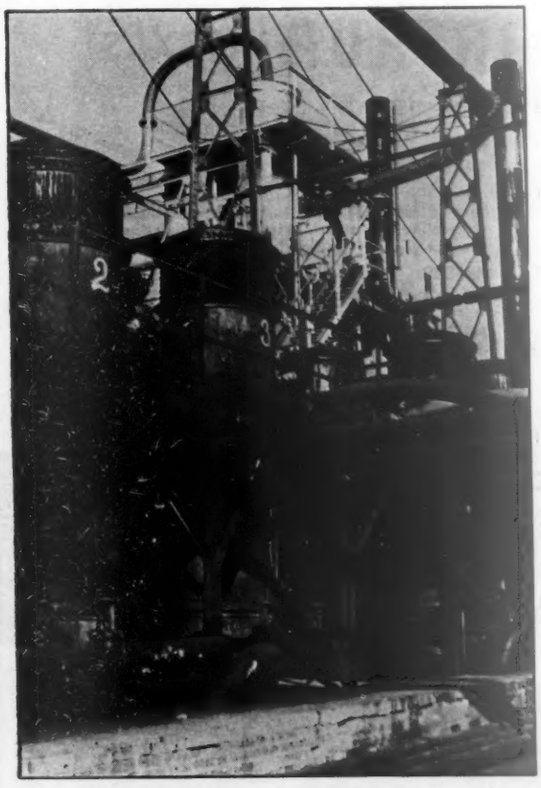
With regard to the other two refineries at Tampico and Minatitlan, respectively, throughput has decreased both as regards cracking and primary distillation. These two refineries were nothing but a collection of obsolete equipment. For instance, in the Minatitlan refinery the principal distillation unit was an old-fashioned Trumble plant about 12 years old, which had 11 Coalinga heating coils, each one with a separate pump, and the whole plant entirely without instruments. In order to control the crude pumps, operators had to count the number of strokes of each of the 11 charging pumps. Naturally, it has not been possible to maintain throughput with this old equipment, as the heating coils are continually in repair. Orders have now been placed with a well-known California firm for two modern heaters with instrument control to substitute for this obsolete equipment.

At Minatitlan the cracking unit is completely shut down. The reason for this is that its operation was uneconomical, since it had to operate on gas oil for which there is a market available at such a good price that it is more profitable to sell the gas oil as diesel fuel than to crack it to obtain gasoline.

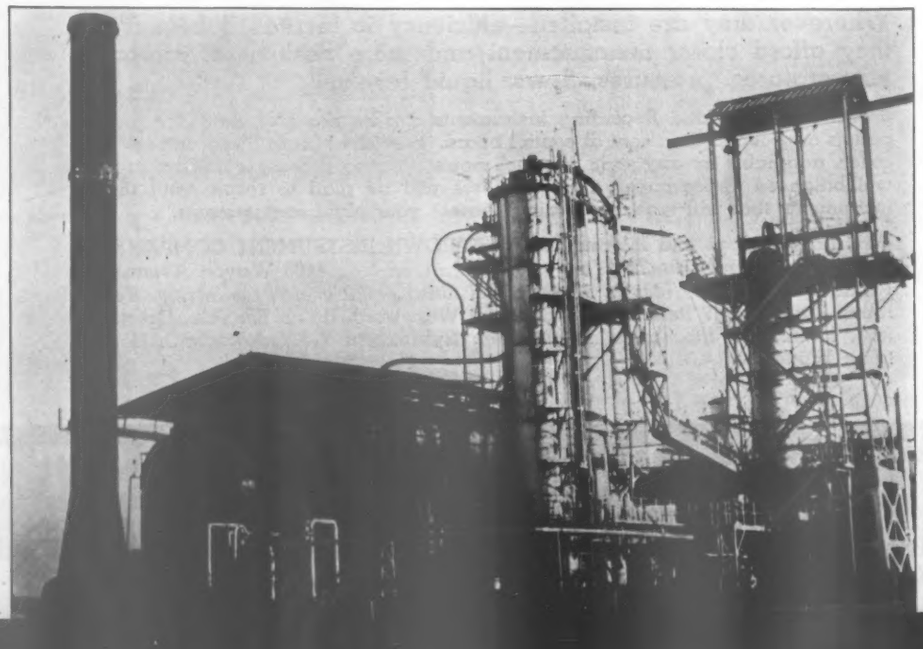
This plant is of a very old design and evidently, at the time of its construction, its designers had not foreseen the possibility of cracking fuel oil instead of high-price diesel fuels. The plant is now obsolete and if it is to be operated again profitably must be completely reconstructed, so as to be able to operate on low-price residual oils.

In consequence of the above, the throughput at the Minatitlan refinery is today only 22,000 bbl. per day on an average, as against 30,000 bbl. per day previous to the expropriation, and, as mentioned before, cracking has been discontinued because it does not pay to crack diesel fuel.

At the Tampico refinery all the plants are in operation. The Dubbs reformer is refining 5,000 bbl. per day, and the Gyro plant is still being operated, although with a different charge to that before the expropriation. This Gyro plant is over 10 years old, and it was constructed with used equipment in the first place. For instance, the condensers and the coolers were previously in service in the old Corona refinery at Tampico and they were already 8 years old when they were installed 10 years ago in connection with the Gyro plant. The Gyro plant was never considered an economic success by the company, due to its high upkeep cost; however, by charging it with a blend of suitable low-cost materials, it is being operated at a profit.



Trumble plant at Minatitlan, principal distillation unit of the refinery



Dubbs cracking plant at Minatitlan, which at present is shut down

Pulling Sea Loading Line on Venezuelan Coast

A NEW and unique set-up was recently used successfully to pull 3,300 ft. of 14-in. sea loading line at Guiria on the northwest coast of Venezuela.

Pulling was started on the line at 9:20 and although it was necessary to stop the pulling operation for about 5 minutes, no difficulty was experienced in starting it again; the line was successfully landed at 9:45, in a total elapsed time of 25 minutes.

The entire length of the line was strung out on shore and after welding it was mounted on 25 old tractor-tread rollers supported on the ground on timbers. The old tractor rollers were welded to frames of junk rail as shown in Fig. 1. This method proved to be entirely satisfactory and it is estimated that it resulted in a saving of approximately 70 per cent as compared with the cost of constructing a railroad track of the type previously used for pulling sea lines. The line was pulled into place by means of a tractor pulling against a block anchored approximately 4,000 ft. offshore. This method proved to be superior to that of towing the line by a tanker, as better control was maintained and a straighter line resulted.

The pipe used was 14-in. o.d., 72 lb. per ft., double-bell and chill-ring pipe. The joints were electric-welded. Four beads were run on each weld instead of the usual three in order to insure a good job.

As the line was welded it was placed on tractor rollers with a side-boom tractor as in Fig. 2. A special roller consisting of three rollers was placed near the beach where the line went over a small cliff. This is shown in Fig. 3. The pipe was given two coats of "cold coater" paint after welding was completed and as the line was pulled a crew kept spots touched up which had been scraped passing over the rollers. Figs. 4 and 5 show the line in place ready for pulling.

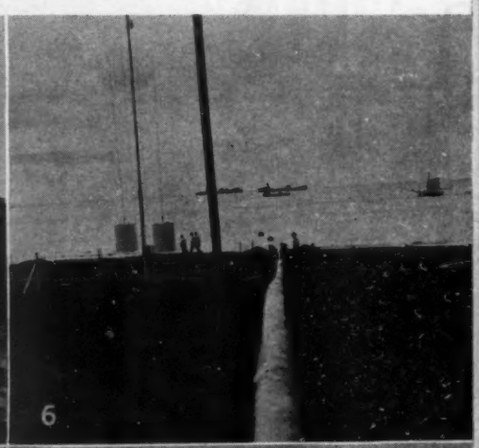
For pulling the line a large snatch block was made fast to an anchor and this was spotted at the point selected for the new berth. A ⅞-in. swabbing line was run from the end of the pipe through the snatch block and back to shore where it was hooked to a tractor. Two small buoys were tied to the end of the line to make it possible to watch its progress and to facilitate catching the cables connected to the end of the line to be used in hoisting it up for connecting the hose. In Fig. 6 the two buoys are shown and the derrick barge, anchored over the snatch block, can be seen in front of the two tankers further out in the bay.

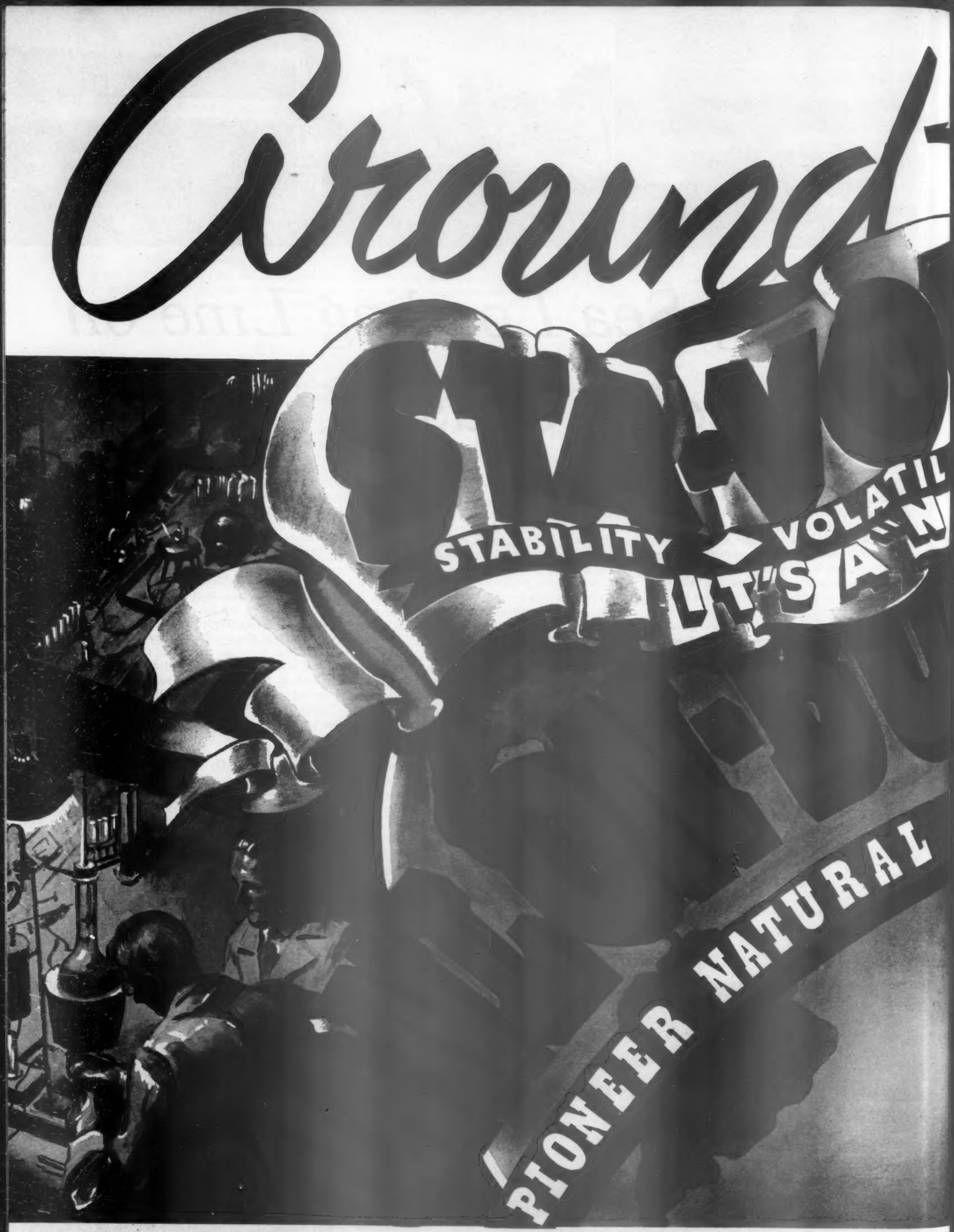
The end of the cable was brought ashore over a tractor roller, and another roller was rigged on the rear of a tractor. This was to act as a guide to keep the cable from pulling into the bush on this side of the clearing. (Shown in Fig. 7).

When all was in readiness, the cable was hooked to a tractor (Fig. 8) and a side-boom tractor held up the end of the pipe to keep it from dropping after passing each roller (Fig. 9).

When the line was in place a diver was sent down to take out a 1½-in. plug screwed into the bull plug on the end of the line to let the line fill with water.

Even though the tide was flooding at the time the line was pulled, there was no appreciable tendency for the current to carry the line and it went in practically straight.





Over A Quarter Of A Century

Current Research Work at University of Birmingham, England, on

Principles and Methods of Refining Lubricating Oil and Paraffin Wax

By T. BROWN

James Young Exhibitioner, Department of Oil Engineering and Refining, University of Birmingham, England

A COMPREHENSIVE scheme which had as its object the application of phase-rule principles to the solvent refining of lubricating oils and waxes in general and to the sweating of wax was initiated in the department of oil engineering and refining, University of Birmingham, in 1932. It was intended that the scheme should not only be successful in deriving the fundamental principles of such physical, and until now, largely empirical processes, as solvent refining, dewaxing, deasphaltizing and the deoiling and sweating of wax, but that these principles should be applied in the comparison of existing processes and in the development of new processes.

The original conception of the application of phase-rule graphical methods to oil-solvent systems was due to Dr. T. G. Hunter and Prof. A. W. Nash[1] of the department of oil engineering and refining, University of Birmingham, who successfully applied triangular diagrams in the single-solvent refining of lubricating oils as a basis for the derivation of computations in batch and multi-stage processes. The property of v.g.c. was used to indicate the alteration in the nature of the oil during refining.

The extension of this type of graphical representation to systems containing wax, in addition to oil and a single or double solvent, was made by Maung Ba Thi, Strang, Hunter, and Nash.[2] In this department they were concerned mainly with the evolution of phase-rule graphical methods as a means of deriving computations for solvent-dewaxing processes employing a single or double solvent. The object of this work was primarily to establish a quantitative fundamental basis for the computation and calculation of process results and to demonstrate the effect of process variables in such a way as to eliminate permanently a great deal of experimentation and thus introduce considerable process economy.

This was accomplished for three and four-component-type oil-wax-solvent systems[3] as explained in the authors' publications.

A Quaternary System of Pure Components[4]

In an extension of the work on solvent refining employing a single solvent, as begun by Hunter and Nash, to refining using a double solvent, it was decided to use pure components because an initial study of the sulfur dioxide-benzol-oil system, a four-component-type system, using the experimental data of Thompson,[4] was not satisfactory owing to lack of knowledge on the fundametals of such systems, and certain doubts existed as to the correct interpretation to be applied.

The pure components used were acetone, chloroform, water, and acetic acid, and the system had therefore no solid components.

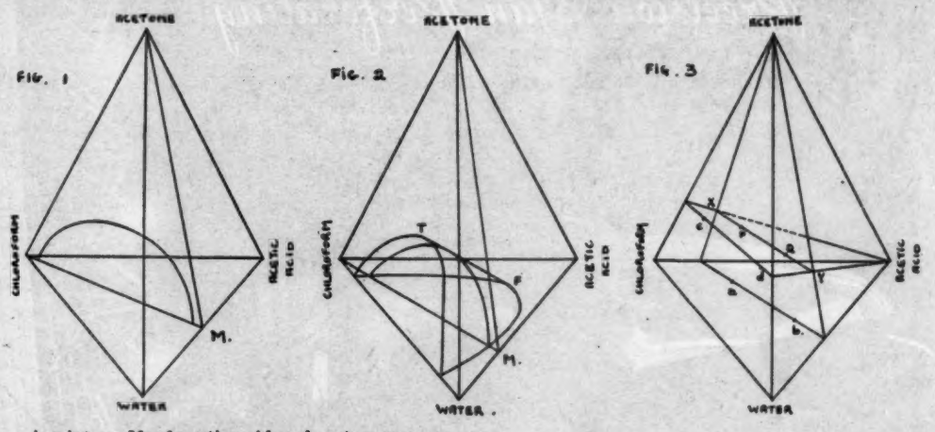
The object of this research was to ascertain the shape or contour of the quaternary equilibrium surface and the geometrical position and physical significance of the quaternary tie lines for a system of four liquids, two of which are immiscible.

In addition, having established the equilibrium and tie-line data with accuracy, computations could be applied. By computations in this case is meant the effect of changing certain variables on the yields and qualities of raffinates and extracts, and also the number of theoretical stages necessary to obtain raffinates and extracts of a given quality.

As will be appreciated, the above pure-component system lends itself to ease of analysis and of separation. Emulsion formation, entrainment or phase holdup, common to oil-double solvent systems, will not occur.

The two ternary systems (acetone-chloroform-water and acetic acid-chloroform-water) were determined in the usual way and the results agreed with those existing in the literature.

The next step was the determination of the quaternary equilibrium surface, and this was done simply as follows (Fig. 1):



A mixture *M*, of acetic acid and water, was prepared and an equilibrium curve obtained for the system, *M*-acetone-chloroform. A series of mixtures M_1, M_2, M_3, gave a series of equilibrium curves each situated on an equilateral triangle in the tetrahedron. These curves, together with the ternary equilibrium curves, demarcated the quaternary surface depicted in Fig. 2.

The question then arose as to the nature of this quaternary equilibrium surface, i.e. whether concave, convex, or planar. It was found that the surface was such that lines such as *TF* which lay on the equilibrium surface were straight. Consequently the quaternary equilibrium curve of Fig. 1 could be calculated.

Having found the quaternary equilibrium surface it was then necessary to determine the position of the quaternary tie lines. Now there were several possibilities for the position of such a tie line but it was found to be situated on the line of intersection of two planes. Each of these two planes contained a ternary tie line and a tetrahedral apex. (Fig. 3.)

Thus *ab*, *cd*, are the two ternary tie lines. *XY* is the line of intersection of the two planes and *PQ* is the quaternary tie line, where *P* and *Q* are on the quaternary equilibrium surface.

Further, a series of quaternary tie lines in the same plane form a tie-line curve which is also the curve of section of the given plane with the equilibrium surface.

Tie lines[5] for pure-component ternary systems, containing two immiscible components, may be calculated from a knowledge of the critical point *K* and *M*, the mutual solubility of the two immiscible components. The method employed is shown in Fig. 4. A straight line is obtained from the typical curve *MK*. It has been found that a straight line is obtained directly for some ternary-type oil-solvent systems where the oil and solvent are partly miscible.

Double-Solvent Dewaxing Processes[6]

Contemporary with the extension of the solvent refining research scheme on the lines indicated above, a similar extension of the solvent dewaxing

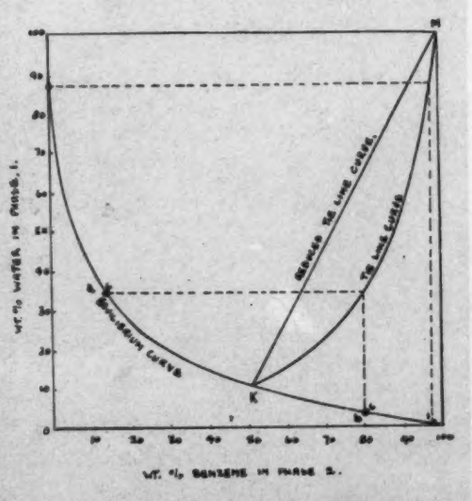
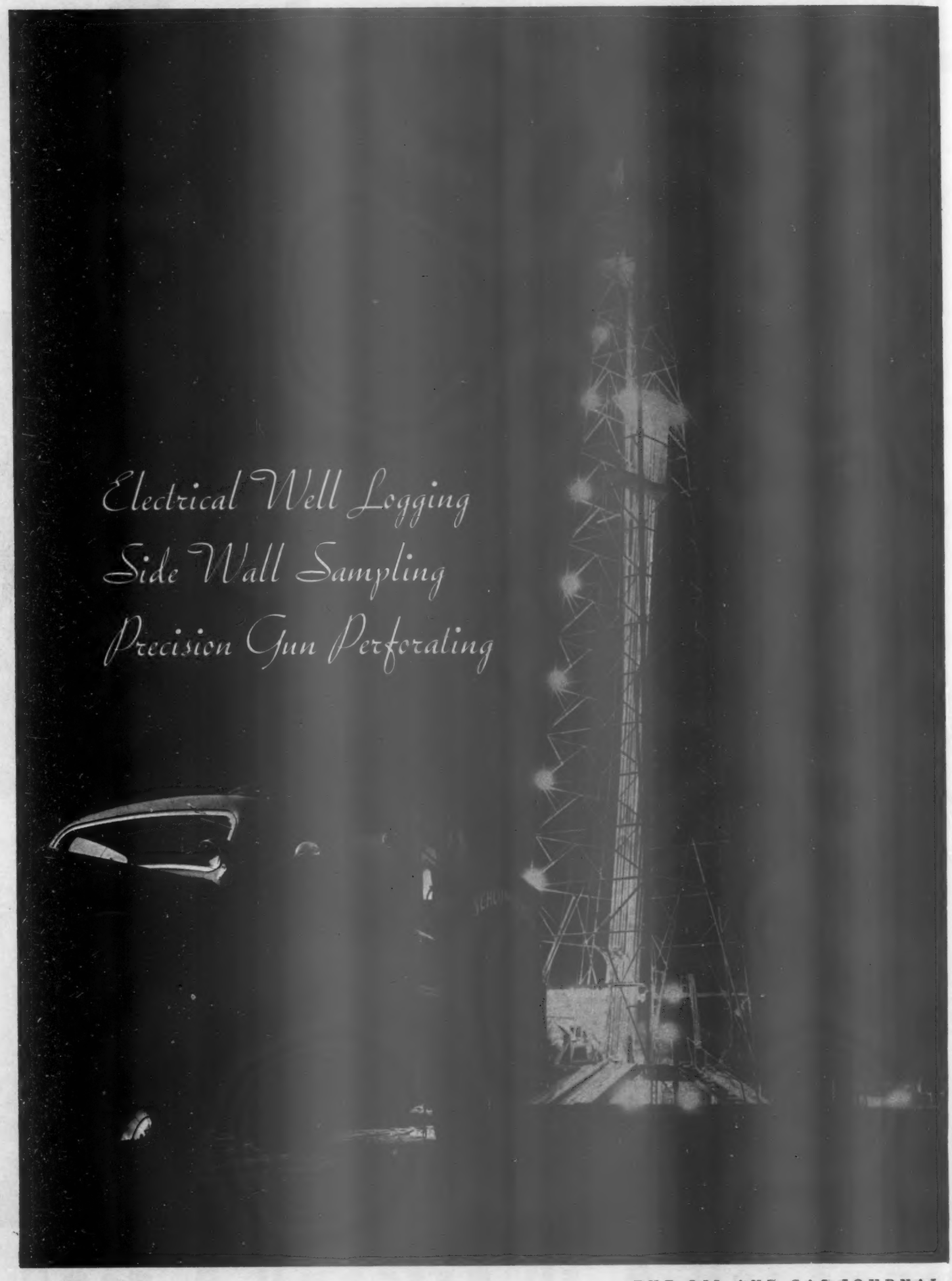


Fig. 4—Tie lines for system benzene-alcohol-water


Electrical Well Logging
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scheme as originated by M. Ba Thi, Hunter, and Nash,[2] was made in an examination of double-solvent dewaxing processes on a comparative basis.

For the purpose of this comparison it was necessary to standardize the methods of interpreting the results and as it was desired to use the equilateral triangle and the regular tetrahedron to represent ternary and quaternary-type systems as described by Ba Thi, it was also necessary to represent both wax and oil as single components.

Hydrocarbons Removed

This was accomplished by choosing, in the first place, a narrow dewaxed lubricating-oil cut from the refinery. The residual 7.0 per cent low-melting wax which it contained was removed in the laboratory by chilling to —35° C. in ethylene dichloride. Likewise, and in the same operation, those hydrocarbons present in the oil which were closely allied to the wax in melting point were also removed. The resulting refined and dewaxed oil was found to be miscible with the solvents under investigation at the chosen equilibrium temperature of 25° C.

Secondly, in order to represent wax on the ternary or quaternary diagram as a single component, very close-cut fractions of wax were used. In an initial study a wax fraction of the highest melting point obtainable commercially (56.86° C.) was used. The low-melting wax (m.p. 23.6° C.) isolated from the lubricating-oil fraction was also used. This would yield results which were more indicative of the actual dewaxing process, as the oil and the low-melting-point wax came from the same stock. Low-melting wax was ultimately replaced by cetane (m.p. 17° C.) which was found to be of a similar nature to the wax (m.p. 23.6° C.) and had the advantage of being a pure hydrocarbon.

The wax (m.p. 56.9° C.) was used to obtain the quaternary equilibrium shown in Fig. 5, in heavy

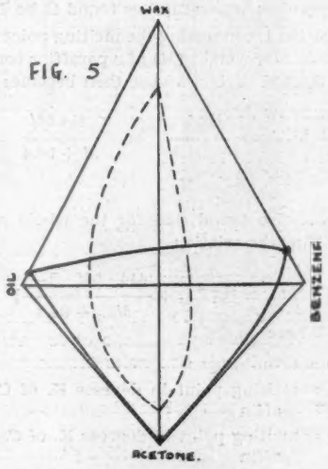

FIG. 5

line. It illustrates, according to usual phase-rule methods, the dewaxing of a high-melting wax constituent at a temperature below its melting point, viz. 25° C. Dewaxing with double solvents at temperatures above the melting point of the wax was also examined and found to conform to the same principles as the previous dewaxing experiment. This was deduced from the nature of the ternary curves for oil-wax-acetone. The complete quaternary equilibrium surface using the wax (m.p. 23.6° C.) at an equilibrium temperature of 25° C. is shown by dotted lines in Fig. 5. Tie lines are not shown. The composite diagram therefore illustrates the dewaxing of a range of waxes from a melting point of 56.9° C. to 23.6° C. at a temperature of 25° C. using acetone-benzol solvent.

Cetane gives similar equilibrium surfaces to those obtained for low-melting waxes. One advantage of using such low-melting waxes and hydrocarbons is that even low-boiling solvents such as acetone may be examined at atmospheric pressure and at temperatures above the wax melting point without undue loss of solvent by evaporation.

It is proposed to complete these investigations using cetane by an investigation and comparison of various solvent combinations used in commercial practice, at temperatures above the wax melting point, both in batch and multiple contact processes. The advantage of using this type of solid representation is that computations and relative efficiencies for the various solvent processes can be deduced geometrically and an accurate assessment of the relative merits of single and double-solvent processes can be made.

This work is being extended to include oils which are immiscible with the solvent at the equilibrium temperatures and a more complicated diagram will be obtained.

It is obvious that a complete picture of this dewaxing process at elevated temperatures can only be obtained by extending the comparisons to different types of oil, the constitution of which is approximately known, as is that of the oil in the present discussion.

Application of Phase-Rule Principles to Wax Sweating[1]

As in the cases of solvent refining and dewaxing a recent attempt was made to study the fractional melting of oil-free wax mixtures on a phase-rule basis. The ultimate intention was to apply the equilibrium diagram obtained to the sweating process employed industrially in the refining of paraffin wax, which is essentially a multistage fractional melting. By treating these wax mixtures as a continuous series of solid solutions a diagram exhibiting the characteristics of that

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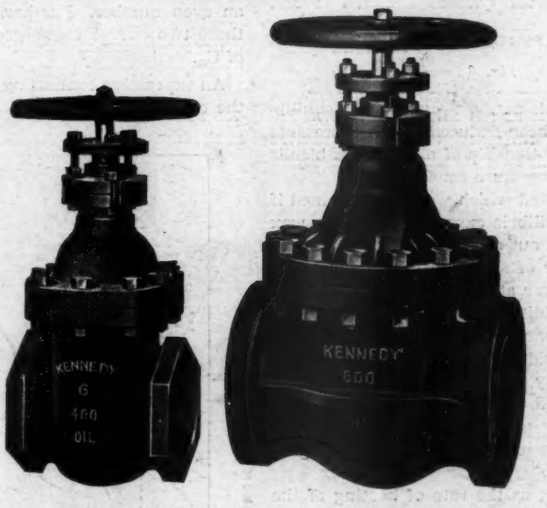

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shown in Fig. 6 should have sufficed to represent the equilibria of liquids and solids under various conditions of temperature. It was found, however, that when the equilibrium relations of a given wax blend were examined in more than one stage a higher yield of lower melting-point solid-phase wax was obtained than would have been anticipated from a knowledge of the equilibrium curves for one-stage or batch experiments. This is illustrated in Fig. 7.

Making use of a property of wax mixtures called "hypothetical molecular weight," and dealt with

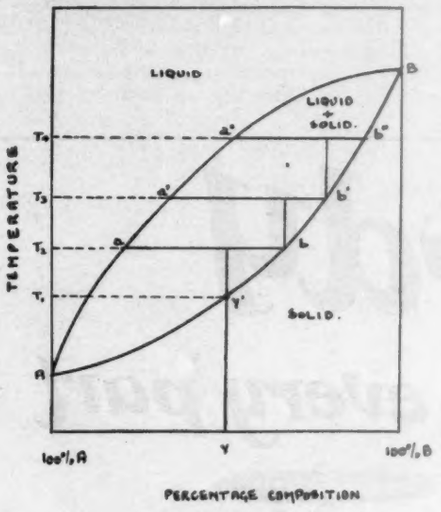

Fig. 6

in detail later in this paper, a quantitative equilibrium diagram has been deduced which represents the equilibrium relationship of oil-free wax blends under varying temperature conditions.

This diagram is that which would be obtained if the liquid-solid equilibria experiments on the wax blend were carried out as a multistage process in an infinite number of steps and it is approached practically, but never attained, when the blend is examined in a definite large number of steps. It is obvious that a particular experimentally determined diagram, besides being an approximation to the theoretical, only applies to the particular oil-free wax stock used, but its theoretical basis has been supported by experiments in a laboratory sweating apparatus on the fractional melting of oil-free wax blends.

It was found that as the rate of heating of the wax mass decreased, the curve obtained from the rectangular plots of percentage yield of solid wax versus melting point of the fractions obtained, approached closer to the equilibrium curve as determined experimentally in a multistage process.

So far it has been found impossible to derive a similar equilibrium diagram for a wax blend containing oil. The actual industrial sweating process has therefore been investigated, not on a phase-rule basis, but by means of a study of the effect of altering the following variables:

(*a*) Extent of deoiling of stock (examined at constant sweating rate).

(*b*) Rate and extent of cooling prior to sweating.

(*c*) Rate of sweating.

(*d*) Viscosity of oil.

To insure uniformity of the results for purposes of comparison, one wax stock and two stocks of dewaxed oil were used in the form of synthetic mixtures throughout this investigation of the sweating process.

The Solvent Refining of Paraffin Wax[5]

Waxes of low molecular weight have a greater solubility than those of high molecular weight. It was therefore suggested that by means of a suitable solvent, waxes of lower molecular weight could be extracted from a mixture of waxes of different molecular weights. The melting point of a wax is a function of its molecular weight and increases with increase of the latter. Hence waxes of a lower melting point are extracted by means of a solvent and therefore are separated from the wax mixture, leaving behind waxes of higher melting point.

The melting point of commercial waxes is not quite additive. Hence for the purpose of characterizing the wax fractions obtained and representing the equilibrium relationships on triangular coordinates an additive property of these fractions was evolved and involved the use of both molecular weight and melting point. The similarity which existed between the melting point-composition curve and the curve giving the relation between melting point and molecular weight of normal paraffins enabled the desired function to be evaluated.

It was therefore decided to apply the function $M = f(T)$, where T is the melting point and M is the molecular weight, to paraffin waxes, assuming that paraffin waxes and pure normal paraffins of the same melting points have the same molecular weight. As this may not be quite true, it was also decided to regard M, not as the actual molecular weight of the wax, but as a "hypothetical molecular weight," or in other words, a number.

By plotting melting point in degrees K. versus molecular weight for the normal paraffins, two curves were obtained, one for those with an odd number of carbon atoms and one for those with an even number. Further, it was observed that these two curves converged to one in the region of C_{23}.

An expression connecting the melting point with the corresponding molecular weight, which is ap-

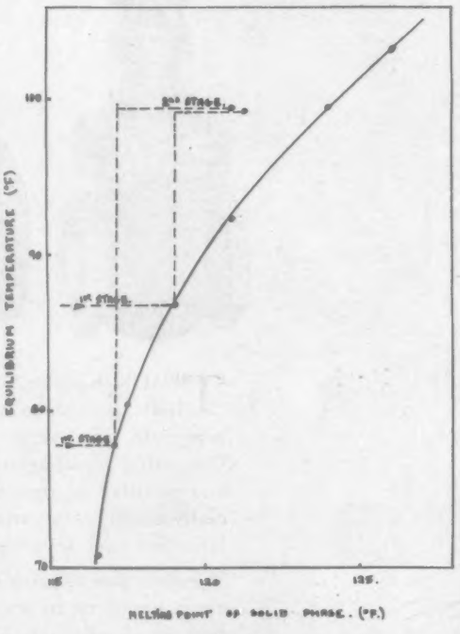

Fig. 7

plicable to this common curve may be obtained as follows:[6]

Let M = molecular weight of n-paraffin of melting point = $T°$ K.

Assume $dM/dT = k^3$, where $T = f(M) = (aM+b)$ where k, a, and b are constants.

Then $dM/dT = k(aM+b)^3$

$$\therefore\ dT = \frac{1}{k} \cdot \frac{dM}{(aM+b)^3}$$

$$\therefore\ T = -\frac{1}{ak} \cdot \frac{1}{aM+b} + \text{constant} \quad (1)$$

When $T = 0$, $M = 0$, $\therefore$ constant $= 1/akb$.

Equation 1 now becomes

$$T = \frac{1}{akb} - \frac{1}{ak} \cdot \frac{1}{aM+b}$$

$$= \frac{1}{akb}\left[1 - \frac{1}{\frac{aM}{b}+1}\right]$$

$$= \frac{1}{akb} \cdot \frac{\frac{a}{b} \cdot M}{\frac{aM}{b}+1}$$

$$= \frac{1}{akb} \cdot \frac{1}{1+\frac{b}{aM}}$$

$$\text{i.e., } T = Tf \cdot \frac{1}{1+c/M} \quad (2)$$

where Tf and c are both constant, being equal to $1/akb$ and b/a, respectively.

Equation 2 may be expressed in the form

$$T_f = T(1+\frac{c}{M}) = T_x(1+\frac{c}{M_x}) = T_y(1+\frac{c}{M_y})$$

from which $$c = \frac{T_y - T_x}{\frac{T_x}{M_x} - \frac{T_y}{M_y}}$$

This constant c may therefore be calculated from a knowledge of the melting points and molecular weights of any two n-paraffins, and the average figure of $c = 94.4$ was obtained from a number of such calculations. By substituting this value of c in Equation 2, T_f (which obviously represents the convergence temperature) is found to be 414.5° K.

Equation 1, connecting the melting point ($T°$ K.) and molecular weight (M) of n-paraffins containing more than 21 carbon atoms, then becomes

$$T = \frac{414.5}{1+\frac{94.4}{M}} \quad \text{or} \quad \frac{414.5M}{M+94.4} \quad (3)$$

It was also found that for the whole range of n-paraffins the relation

$$T_n = \tfrac{1}{2}[T_{n+1} + \frac{414 \cdot 5M \cdot n-1}{M_{n-1}+94.4}]$$

held. Where

n = even integer

T_n = melting point in degrees K. of C_n n-paraffin

T_{n+1} = melting point in degrees K. of C_{n+1} n-paraffin

M_{n-1} = molecular weight of C_{n-1} n-paraffin

These equations give excellent agreement between actual and calculated values.

Using these relationships for the calculations of "hypothetical molecular weights" of waxes from their melting point, an equilibrium diagram and tie lines were obtained by performing a series of batch solvent extractions of prepared wax blends with solvents, and accurately separating the solid and liquid phases. The melting points of the solvent-free phases yielded the corresponding "hypothetical molecular weights," which were plotted on triangular coordinates together with the percentage solvent in the phase at equilibrium.

The diagrams obtained using various solvents were an excellent representation of batch processes. The tie lines obtained with increasing percentages of any one solvent were all parallel on the triangular diagram. However, it was found that multistage extraction yielded a second curve which diverged from the equilibrium curve obtained for

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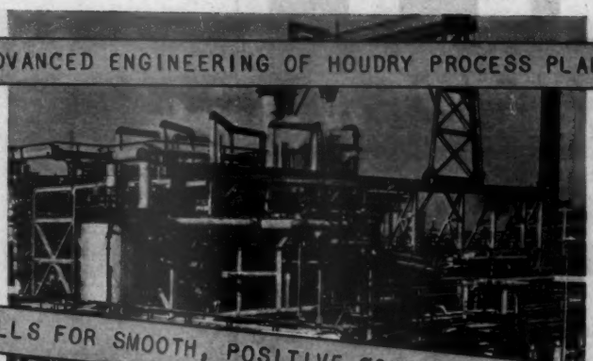

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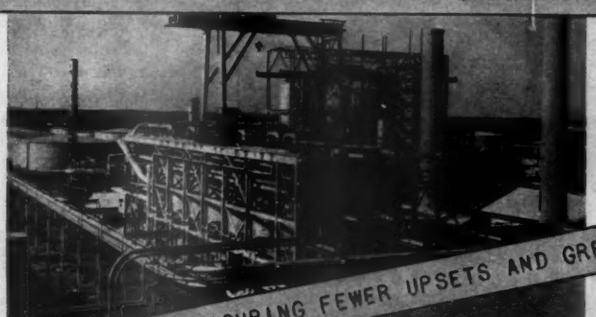

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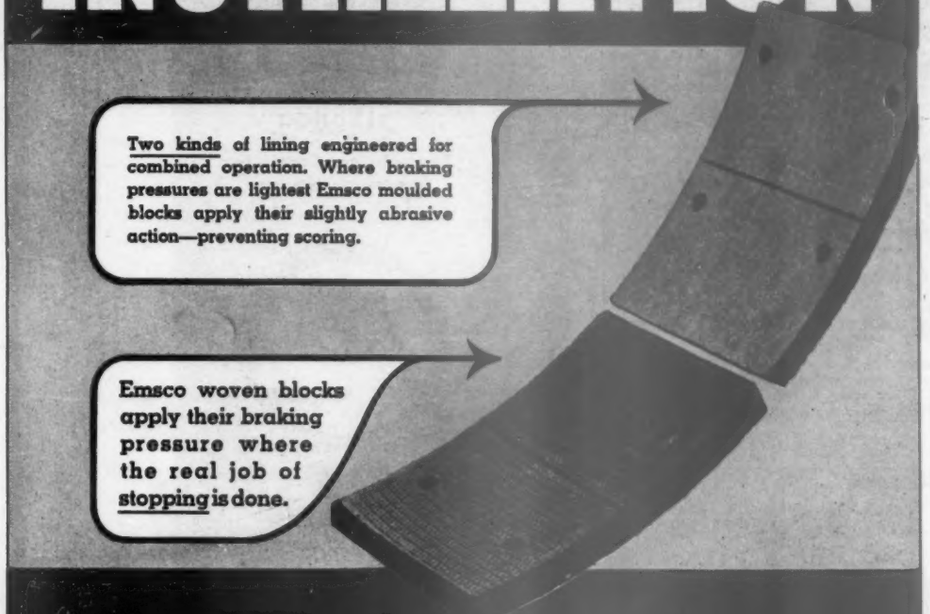
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batch extractions, as the number of extractions increased.

Fig. 8 shows this divergence very well. It will be noted that the graphs of solubility versus "hypothetical weight" obtained for a single-stage process are straight lines, while for multiple extraction these are curves. The explanation of this is that waxes obtained by the multiple-extraction process possess a higher solubility for the same melting

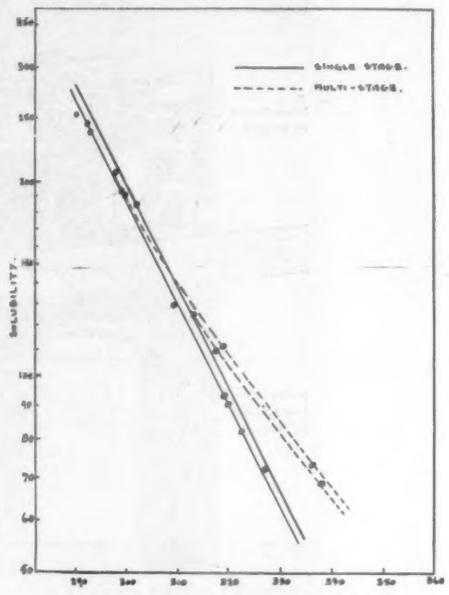

Fig. 8—Hypothetical molecular weight

point than those obtained by means of a single extraction process. The tie lines, in the triangular coordinate diagrams, obtained for multiple extraction do not coincide with those for single extraction. Because of this, computation of the data cannot be achieved, i.e., having established the curve for a single extraction the data for a multiple process cannot be predicted.

Complete papers on all the research problems described above will be published shortly.

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Venezuela Plans Big Expansion

MORE than $1,900,000 will be made available to the Venezuelan Petroleum Co. of New York and subsidiaries for drilling, exploration and exploitation expenses in Venezuela under a declaration of purposes in a registration statement filed with the Securities and Exchange Commission in Washington last week. The statement was filed by the Venezuelan Petroleum Co., subsidiary of Consolidated Oil Corp., covering the proposed issue of 2,000,000 shares of its $1 par-value common stock.

Proceeds of the issue, after deduction of expenses and $225,000 for repayment of a loan to the parent company, are to be applied to development of concessions in Venezuela. The shares will be offered to stockholders at $1 a share. There will be no underwriters. Consolidated Oil Corp. has agreed to buy the unsubscribed shares at $1 a share.

Venezuelan Petroleum Co. has holdings in various parts of Venezuela, but very little development work has been done in recent years.

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ALASKA WILDCAT

(Continued from Page 84)

P. B. Reed, three drillers, three tool dressers, one cook, two tractor drivers, one radio operator and two roustabouts. It took 17 days to discharge the cargo at Portage Bay where it was lightered from the ship to the beach where a temporary camp had been established. The equipment consisted of one 84-ft. derrick, casing, tools included fishing tools for nearly every emergency, engines, camp buildings, commissary supplies, dynamos for electric lighting, a wireless outfit, two 64-hp. tractors and three trailers, road building equipment and about 60 tons of planks and timber for construction of bridges and culverts. The present attempt is much better equipped from a mechanical standpoint.

The joint wildcat now being drilled is about 4 miles west of tidewater in contrast with the Standard's initial test which was approximately 17 miles inland and separated from the tide line by two ranges of mountains and several miles of swamps and tundra lands. The present joint test will have the Lower Jurassic-Triassic contact as its ultimate objective. It started in the Shelikof formation of Upper Jurassic, and, due to an unexpected thickening of the section, the bit was still in Jurassic rocks at last report. The Jurassic and Triassic are of Mesozoic era and the former is productive in Wyoming. The present well is on the Bear Creek-Salmon Creek anticline but the group holds operating leases on the Pearl anticline and the Hubbell dome in addition to two others somewhat removed from the present operations. The Bear Creek-Salmon Creek anticline is the best looking as well as the most accessible.

The Alaskan Peninsula is a wedge-shaped mass extending from northeast to southwest and tapering toward the southwest. It is about 550 miles long and at its northeast end is about 100 miles wide. The coastline is very irregular, having many indentations and bays which in some cases almost cut through the peninsula. The Aleutian Range runs practically the entire length of the peninsula, and between Port Moller and the base it lies much closer to the Pacific side. This asymetric position of the mountain range gives the south side of the peninsula a very bold, rugged appearance, but the north side is bordered by a wide lowland containing many lakes and swamps. The Cold Bay district in which this wildcat is being drilled lies almost entirely within the limits of the mountainous area. From Cold Bay to Portage Bay, the coastal range is rather rugged and occupies a belt extending about 10 miles inland.

The occurrence of petroleum in sedimentary rocks of the Alaskan Peninsula has been known for more than 60 years, but until about 1920 only a small part of the peninsula had been mapped, either geologically or topographically. The presence of petroleum in sedimentary rocks is disclosed by numerous seeps at several places. Prominent seepages have been found in the Cold Bay area, the location of the joint wildcat under way, and around Aniakchak Bay and Chignik. The seepages in the Cold Bay area are found in two groups lying along the two lines of anticlinal folding, and several prominent seepages have been found along the Bear Creek-Salmon Creek anticline in close proximity to the location selected for the wildcat now drilling. There are two prominent seepages on Pearl Creek anticline, another structure held by Standard, Union and Tide Water Associated which will be explored if the present test proves successful. These seepages emerge from sandstone rocks of the Shelikof formation well down on the flank of the fold. In addition to these and other seepages, several points have been found where natural gas emerges several hundred feet apart at the foot of a bluff on the edge of a narrow valley in the east fork of the Kejulik River.

The log of the well shows several sand bodies, but in every case they were too tight to yield production, even if saturated, as the porosity was abnormally low. A change in porosity due to a change in the coarseness of the sediments deposited, a variation in porosity due to a variation in the amount of cementing material, and the presence of lenticular bodies of sandstone, are all features that may be of prime importance in their influence upon localization and accumulation of oil. The change in porosity and the presence of lenses of sandstone are likely to be of more importance in sediments deposited in shallow water and near the shore, such as most of the sediments in the Cold Bay district. Sediments laid down near the shore are usually of coarser grain than those deposited farther out, but they may grade laterally into fine-grained sediments without any distinct break and where they do there is a gradual change in the effective porosity of the rock and in its effect upon permeating liquids and gases. Sediments in the Cold Bay region, the scene of present wildcatting operations, are known to differ greatly in different parts of the district, but it is impossible to predict just where the porosity has changed sufficiently to cause accumulation.

The structure in the Cold Bay region is simple and is characterized by large features that can be easily followed in the mountainous part. The sedimentary beds have a northeast strike and a dominant northwest dip, but this general trend is interrupted by at least two lines of folds and faults that are approximately parallel to one another and to the coast line. At Portage Bay the extension of the Wide Bay line of folding is seen as a plunging anticline that rises on the east side of the bay and spreads out within a short distance to form the Bear Creek-Salmon Creek anti-

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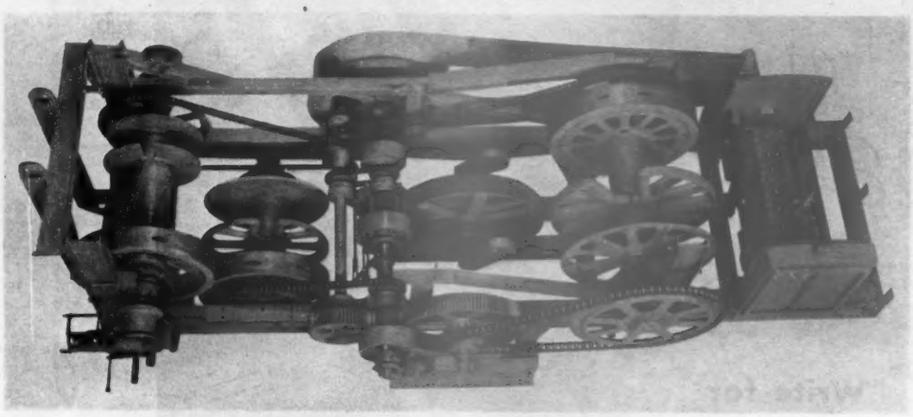

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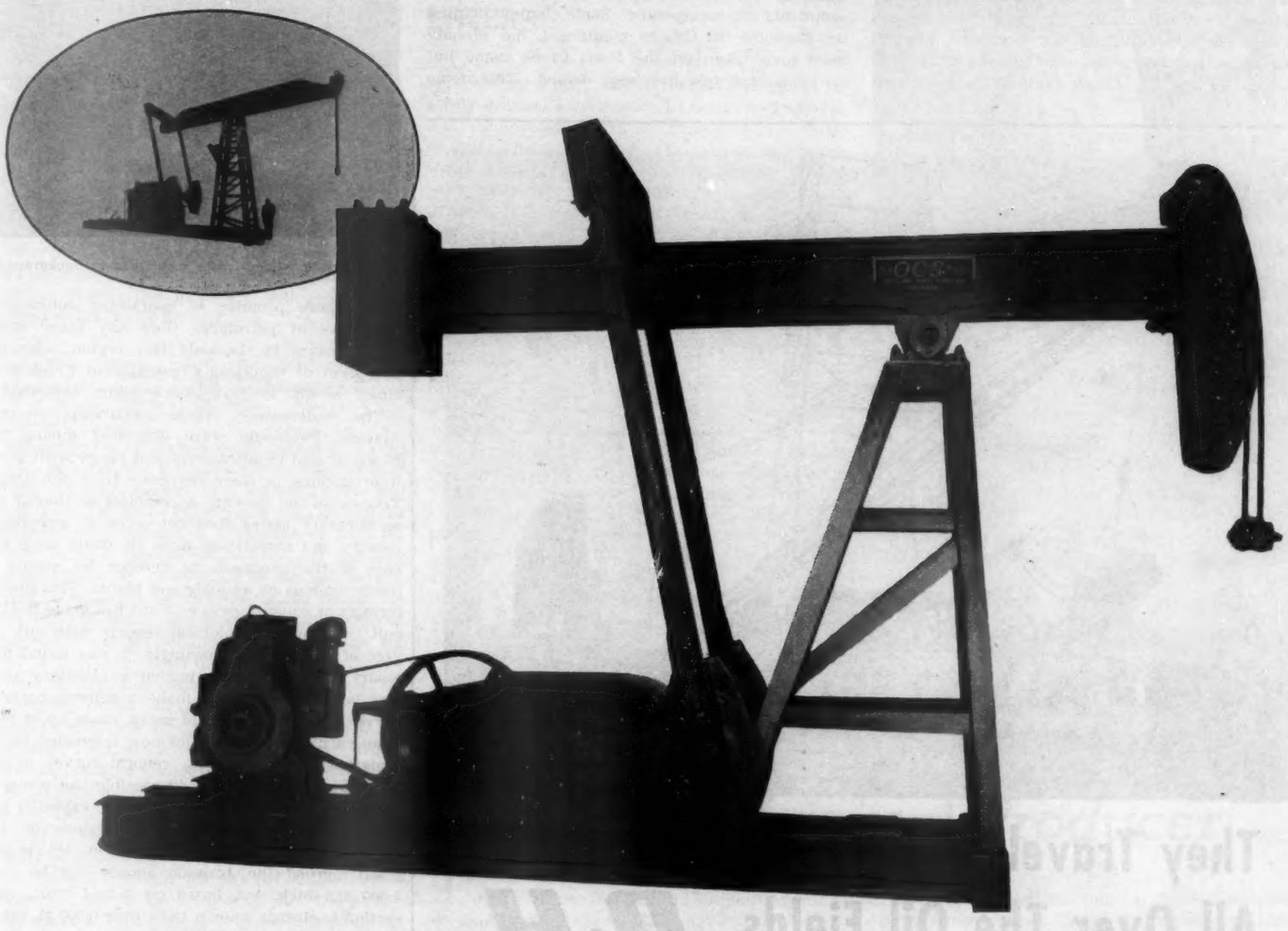

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cline. This anticline, which is conspicuous and well developed, extends from Portage Bay across the headwaters of Bear Creek and Salmon Creek and gradually flattens out near Rex Creek. The southeast flank of the anticline dips only about 4° but the northwest flank dips about 16°. The sediments exposed over the fold consist of sandy shale of lower Shelikof age near the crest and progressively younger beds on the flanks, the Naknek formation cropping out far down on the northwest flank. The Shelikof is the only known oil-bearing formation in this region and it is deeply cut by erosion on the crest of the anticline. The present test will determine the productivity of the lower formations. The Bear Creek-Salmon Creek anticline flattens out northeast of Rex Creek and is succeeded near the head of Trail Creek by the Dry Creek fault. This fault cuts across the head of Cold Bay, and two parallel faults appear on the northeast side of the bay. The south side of the fault has moved down relative to the north side.

The Pearl Creek domal structure which may later be given a joint test is slighthly asymetric and the axial plane is inclined to the southeast in the same direction as the other folds in the region. The southeast flank has a maximum dip of about 30°, but dips as high as 69° have been recorded on the northwest flank. The rocks exposed over the Pearl Creek dome belong to the Naknek formation, and between the crest of the dome and Mount Peulik about 4,000 ft. of Naknek sediments are represented. Some shallow drilling by Standard Oil Co., as mentioned, has already been undertaken on the Pearl Creek dome but no conclusive test has been drilled. This dome

An Alaska wildcat, with mountains in background

offers more promise of containing commercial quantities of petroleum than any other structural feature in the Cold Bay region, with the exception of the Bear Creek-Salmon Creek anticline which is now undergoing exploration.

The sedimentary rocks occurring on the Alaskan Peninsula were deposited during the Mesozoic and Cenozoic eras and range with many interruptions in their sequence from the Upper Triassic to the Recent. A complete section of the sedimentary series does not occur at any single locality and correlation must be made from one part of the peninsula to another by means of fossil remains or animals and plants. This unconformity of subsurface conditions has made it difficult to complete geological reports with any degree of accuracy. Accordingly, it was found necessary in 1937 when the present exploratory party was being organized to make a general regional survey. A joint geological party, made up of men from each of the companies now interested in the undertaking, conducted a general survey of the area to ascertain as far as possible the probable depth at which production might be expected and to determine the probable thickness of the Jurassic rocks in the Cold Bay region. It was generally agreed the Jurassic should not be over 5,000 ft. thick, but based on actual work, this section is already known to be over 6,200 ft. thick.

The Upper Triassic rocks that crop out on Cape Kekurnoi at the northeast entrance to Cold Bay are the oldest sedimentary rocks exposed on the Alaskan Peninsula. The Lower Jurassic rocks occupy a few square miles in a narrow strip crossing the cape that separates Cold Bay from Alinchak Bay to the northeast. This strip is the only known area of Lower Jurassic rocks on the peninsula. There appears to be a strict conformity between the Lower Jurassic and Triassic rocks. but the lack of fossils makes it difficult to determine definitely the contact. This is the condition confronting the petroleum engineers and geologists working on the joint test and is a situation that demands careful work. The sedimentary beds included in the Lower Jurassic based on surface indications are about 2,300 ft. thick. The 1,500 ft. at the bottom may be divided into two parts, a lower part consisting mainly of limestone and limy sandstone and shale, and an upper part in which there is a narrow zone characterized by conglomerate and sandstone containing abundant bright red jasper pebbles, brightly colored greenstone particles and fragments of carbonaceous shale. It is this marker that is being sought because it will establish definitely the position of the hole with respect to original expectations.

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No New German Fields; Production Mounting

By C. H. EHLERS

DURING recent months, the writer has endeavored to obtain detailed information from persons in Germany thoroughly familiar with conditions in the oil industry. All answers contained the familiar phrase that "for obvious reasons" they could not disclose the information. With some degree of accuracy it can be said, however, that during 1939 no new fields were discovered.

Nevertheless, production is apparently mounting rather rapidly in some fields, compared with previous years. The following table shows the output for the first 7 months:

(In Barrels)						
Jan.	Feb.	March	April	May	June	July
Germany (old Reich)						
357,000	358,000	424,500	400,500	436,500	408,000	417,800
Ostmark (Austria)						
37,500	52,500	48,750	60,750	75,000	84,750	97,500

These figures indicate a daily output of 13,343 bbl. or an estimated total of 4,803,000 bbl. for 1939 for the old Reich against 4,125,000 bbl. in 1938 and 3,397,000 bbl. in 1937. The present daily output for the Ostmark (Austria) is estimated to be 2,175 bbl. to reach a total of 793,000 bbl. for the year against 475,000 bbl. in 1938 and 247,000 bbl. in 1937. There is reason to believe the actual output for both the old Reich and Austria is substantially higher. Official production reports give the figures of only the three oldest fields, Nienhagen, Wietze, Oberg, the remaining fields being given collectively under "all other fields." The most important field, next to the Nienhagen area, is the Reitbrook field, south of Hamburg, discovered in 1938 and operated jointly by Deutsche Vacuum Oel A.G. (wholly owned subsidiary of Socony-Vacuum Oil Co., Inc.) and Preussag (German Government-owned). This field is estimated to have approximately 25 producing wells with an initial production of about 1,000 bbl. per day per well. There is reason to believe the Zistersdorf-St. Ulrich (Austria) field, reported to have been extended substantially, has a much larger production than in the so-called "official" reports. Germany's principal field is still the Nienhagen field (north of Hannover), with a monthly production of 225,000 bbl. or 2,700,000 bbl. a year. The production of the old Wietze field, with its famous oil mine, remains stable with a yearly production of about 350,000 bbl. The five principal German producers are:

Gewerkschaft Elwerath, Wintershall Potash Co., Deutsche Petroleum A. G., Deutsche-Vacuum Oel A. G., Preussag (Prussian Mining Co.) The Gewerkschaft Elwerath is still the largest producer in Germany with an output of more than 50 per cent of Germany's yearly total.

Interesting developments may occur in the state of Oldenburg, west of Bremen, comprising about 1,300,000 acres. The concession was originally granted to North European Oil Corp. (Delaware) but transferred to Deutsche-Vacuum Oel A. G. and the Royal Dutch-Shell group. Both groups, joined last year by the German subsidiary of Standard Oil Co. (New Jersey), in all probability are set to explore this concession on a large scale. During 1939, an American seismic group undertook geophysical investigation in the concession. There are several "wildcat" areas which, if reports are correct, will get a play. The Bavarian Government recently granted a concession to Deutsche Tiefbohr, A.G. for development in the Palatinate in counties of Duerckheim, Neustadt, Ludwigshafen, Speyer, Frankenthal. There are also reports that several thousand acres, surrounding Wisckenberg, south of the Wietze field, will see drilling operations in the near future. This land formerly also belonged to North European Oil Corp., and is now in the hands of Deutsche-Vacuum Oel A.G., North European deriving a royalty in case of production.

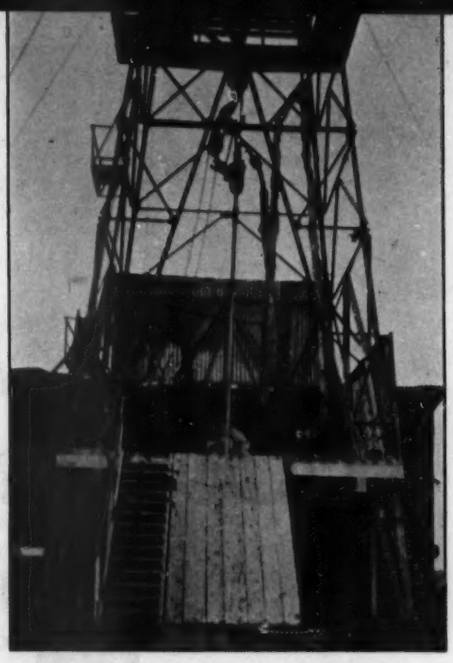
Additional projects are progressing in the region of the city of Bentheim, near the Netherland frontier. A few months ago, a big gas well blew in; but nothing was reported publicly. North European Oil Corp. (Delaware) owned approximately 1,500 acres in the Bentheim district, which it recently transferred to Gewerkschaft Elwerath for a cash consideration plus substantial royalty, other German companies likewise bidding.

Germany's output of synthetic gasoline is estimated to reach 15,000,000 bbl. for 1939 and there are reports another huge plant is under construction at a cost of $80,000,000 near the city of Stettin, which will begin production by the middle of 1940.

Following is the crude-oil production of Germany (old Reich) for 10 years, showing that concentrated efforts to increase the much-needed output were not in vain:

1930	1,272,000 bbl.
1931	1,714,000 bbl.
1932	1,724,000 bbl.
1933	1,789,000 bbl.
1934	2,361,000 bbl.
1935	3,150,000 bbl.
1936	3,335,000 bbl.
1937	3,397,000 bbl.
1938	4,125,000 bbl.
1939 (estimated)	4,800,000 bbl.

In the light of the secrecy which surrounds all reports it may be assumed that the figures for 1939 mentioned, are rather conservative, and that, including the Ostmark (Austria) production, Germany's total crude-oil output will exceed 6,000,000 bbl. in 1939, highest in history.



Wildcat test in the Zistersdorf area in former Austria, now the Ostmark, Germany

Fyzabad Structure Continues Trinidad's Largest Producer

THE Fyzabad structure continued as the largest producer in Trinidad accounting for 40 to 45 per cent of the island's total output. Activity was concentrated between the Forest Reserve, Los Bajos and Palo Seco areas where a continuous productive zone appears to have been established. Interest was also centered on two deep wildcat tests north of the Central Range, but details were guarded by the companies. Trinidad Northern Areas, Ltd., controlled by D'Arcy Exploration Co., United British Oilfields of Trinidad, Ltd., and Trinidad Leaseholds, Ltd., was reported drilling two deep tests in the Talparo district. D'Arcy Exploration, wildcat exploration subsidiary of Anglo-Iranian Oil Co., Ltd., acquired its third interest in northern Trinidad early this year.

Operating technique follows closely practices in the United States. Deeper drilling requirements have forced wide use of the American-type heavy-duty rotary rigs and the engineering application of straight-hole drilling and detailed sampling common in this country have been generally adopted.

The drilling program was mostly routine in connecting proven fields and in extension areas. There were approximately 250 wells drilled although absence of detailed information from the middle of the year made it necessary to estimate both total production and drilling activity for part of the period.

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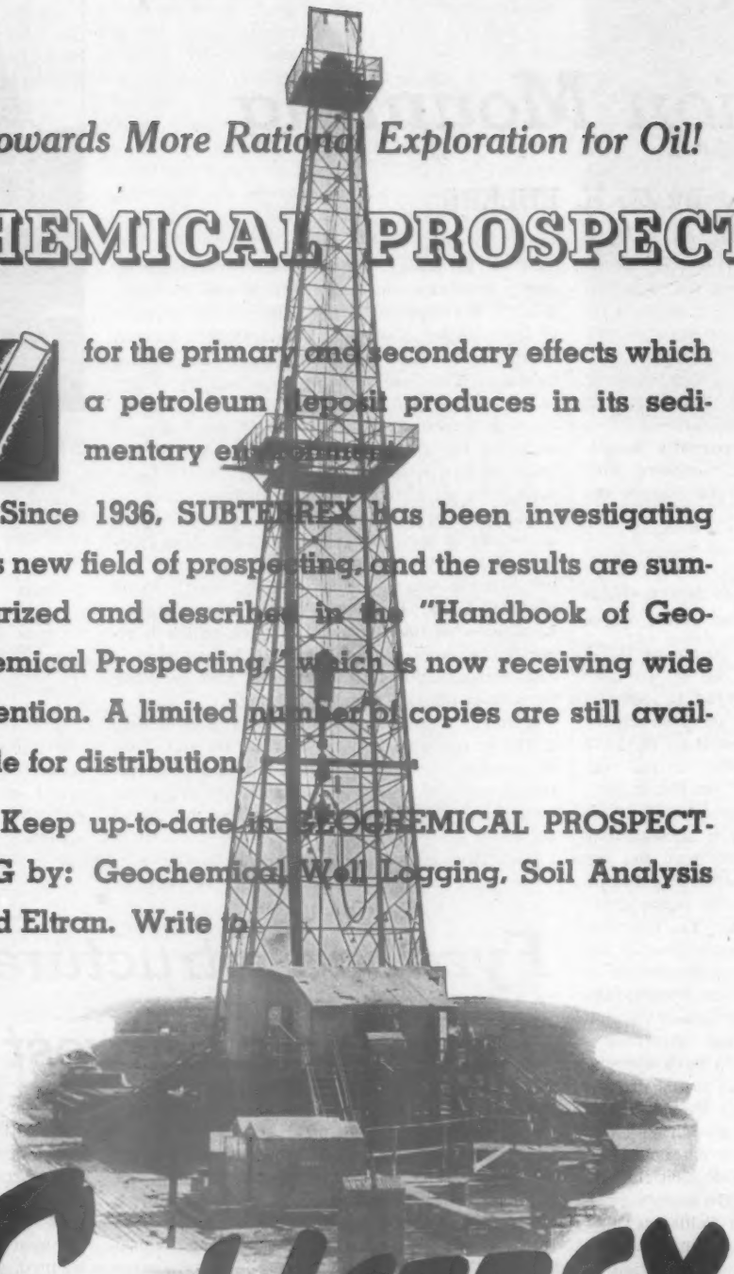

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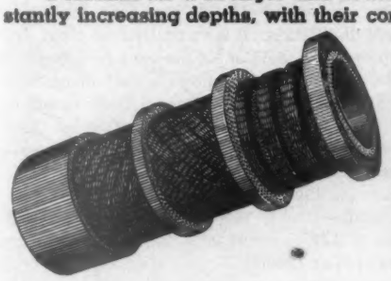

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Since the beginning of the rotary system of drilling, the industry has felt the need of a method of coupling rotary hose which would eliminate the old clamp and stem type of fittings with their exposed bolts, flanges, etc., as well as the inserted stems which, subjected to the turbulent action of sand and slush, soon wore thin enough to form a knife edge to rupture the tube and ruin an otherwise good hose. Again GOODALL took the lead by producing the Barney Stemless, Clampless and Boltless Coupling. A streamlined Coupling which offers ease of handling, strength of construction, simplicity, and a full size opening from one end of the hose to the other—with no exposed metal stem in the hose.

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Still retaining our lead we studied the methods of handling Rotary Hose in the field and found that in transporting the hose between locations that it was often subjected to treatment for which it was not built. Rough handling with winch or cat lines, or coiling in too tight an arc for moving had a tendency to kink the hose and rupture the wire re-inforcing, resulting in a broken hose. The development of the GOODALL Rotary Hose Skid met this condition. A roller bearing horizontal hose reel mounted on skids was developed for the easiest and most practical method of transporting Rotary Hose. This Skid is so constructed that two men can reel or unreel a hose with little effort.

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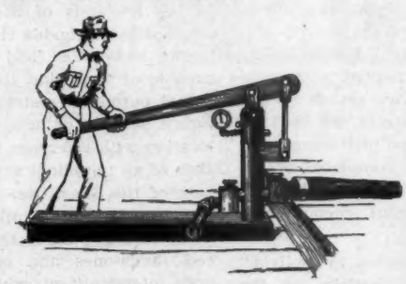

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Bolivia Outlines Program for Coming Year

PROMPT development of Bolivia's two producing oil fields to a daily average output of approximately 11,000 bbl. per day, expansion of the national refining facilities to meet the entire internal demand of the country, and construction of pipe lines and terminals in Argentina for export movement are the chief objectives on the agenda for 1940.

The 1940 program as envisioned by Yacimientos Petroliferos Fiscales Bolivianos, the government petroleum agency, is considered something more than ambitious under the existing conditions. Of the first importance in prosecuting the program is the matter of financial ability. Of almost equal consideration is the problem of technical skill and organization. Possibilities for fulfilling the program appear to be the most promising in the Sanandita field which was discovered by the Standard Oil Co. of Bolivia, subsidiary of Standard (New Jersey), in 1925 and operated by that company until the government canceled the contract on March 13, 1937. Cancellation of the agreement was based on alleged breach of contract, a charge vigorously denied by the company, and a question which remains in process of adjudication.

Two of the four tests started in the Sanandita field by Y.P.F.B. in the latter part of 1938 and in 1939 have been completed as producers, two are still drilling and arrangements have been completed for the early drilling of two additional wells. When the Sanandita field was under the management of Standard of Bolivia, three of five wells drilled were completed as producers.

In the Camiri field, discovered by a well drilled in 1926-27 by Standard of Bolivia, the Y.P.F.B. started two wells in 1939 and they were still in process of drilling at the end of the year.

The two wells completed by Y.P.F.B. in the Sanandita field in 1939 are credited with combined initial production of 1,258 bbl. daily and were being produced at the rate of 690 bbl. per day at the close of the year. The producing wells in the Sanandita field are all completed at approximately 2,000 ft., but one of the early tests was carried to 2,438 ft. without encountering additional oil below 1,644 ft.

"There are three main oil areas in Bolivia," writes Dr. J. Munoz Reyes in articles on the country's petroleum reserves translated from the Spanish. "So far, only one, the Sub-Andean zone, has yielded petroleum in commercial quantities. This zone is along the easternmost ranges of the Andes, bordering the large eastern and northeastern lowlands. It extends from the Peruvian frontier north of Lake Titicaca in a southeasterly direction toward the city of Santa Cruz and from there southward to the Argentine border. This zone forms a belt about 750 miles long by 60 miles wide, averaging 3,000 ft. above sea level, and comprises a series of parallel, very rugged, low ranges of Devonian slates, shales and sandstones.

"The second prospective oil area lies along the eastern and southern border of Lake Titicaca, on the Andean high plateau, at an average altitude of 13,000 ft. It comprises about 2,500,000 acres.

"The third area is called the 'Central zone' and is situated in the Department of Cochabama, covering approximately 12,350,000 acres."

The productive Sub-Andean zone is divided from south to north into 15 fields, or prospective productive territories and they are designated by the following terms: Bermejo, San Telmo, Sanandita, Caigua, Camatindi, Machareti, Buena Vista, Camiri, Saipuru, Guariri, Tatarenda, Espejos, Isiboro, Chapare and Caupolican.

Five Zones on Inactive List

In addition to the Sanandita and Camiri fields which currently produce limited amounts of oil, an exploratory campaign between 1922 and 1928, involving the drilling of more than 30 tests by Standard of Bolivia, resulted in establishment of potential production in the districts of Bermejo, Camatindi, Macharati, Buena Vista and Saipuru. The five potentially productive zones remain closed in and on the inactive list, due to lack of economical means of transport.

The problem of moving Bolivian production to points of consumption is one of the main obstacles to early profitable operation of the proven districts. There are no adequate roads or railroads from the consuming centers to the fields. A plan is under consideration for transportation of oil from the southern part of the Sub-Andean zone to the "altiplano" by the Argentine railway through Jujuy and the high plateau to La Paz and other Bolivian cities. As a further possibility for future consideration, Y.P.F.B. may attempt development of the Chapare district and erect a refinery near Oruro, which would materially lower the cost of internal distribution and free the proven production in the south for export.

An exploration program was carried out this year in the Chapare district near Cochabama and a drilling test is scheduled in this area in the near future. Also scheduled for early exploration by drilling are the Rio Ichilo and Caupolican areas, which are in the best position to supply demand in the lowlands of the Amazon which can be reached by navigable rivers to the Rio Madera.

The Sanandita field is currently considered capable of producing about 1,000 bbl. per day but actual output is restricted to a fraction of that figure because of local refining capacity and its location with reference to markets. The field consists of an anticlinal asymmetric structure at the base of the Sierra de Aquaragüe. The dome-like structure is about 2 miles long and ½ mile wide. In its central part on the surface is a complex of red sandstones and conglomerates with shale beds interstratified, which series has a width of about 2,650 ft. Along this structure oil seepages are found where it has been intersected by cross valleys. Although oil occurs in different geological horizons, the shales of the Devonian age are the most important as a source of production.

The first well in the Sanandita field was drilled in 1926-27 and at 1,440 ft. approximately 50 bbl. of heavy asphaltic crude-oil production daily was developed. Production increased to about 250 bbl. per day at 1,624 ft. and a third oil zone was reached at 2,017 ft. The combined output of the three zones amounted to 550 bbl. per day initially. A second well was drilled in 1927 which was completed for initial flush production of 535 bbl. per day in oil zones between 1,499 and 1,978 ft. A third and smaller well found oil zones between 1,499 and 1,644 ft., but apparently missed the third pay and was carried to 2,438 ft. without additional success. Two failures were drilled in 1929 by Standard of Bolivia.

The first Sanandita field well drilled by Y.P.F.B. was started in November 1938 and was completed in March this year for flush of 755 bbl. at 1,919 ft. Y.P.F.B. completed its second well in August 1939 at total depth of 1,903 ft. for initial of about 500 bbl. The national company is now drilling three wells and plans the completion of 15 additional producers as rapidly as drilling equipment will permit.

All of the producing wells in the Sanandita field are on the northern part of the structure. Future plans call for exploration of the south end which, if productive, will bring the source of supply that much nearer the Argentina border, which it must eventually cross for export, or for access to existing transportation facilities reaching the consuming centers of Bolivia.

The Sanandita field crude yields only 30 per cent gasoline by topping, 19 per cent kerosene and 41.9 per cent fuel oil. It is highly contaminated with sulfur.

The Camiri field crude is high gravity and yields approximately 50 per cent gasoline by simple distillation. It is virtually free from sulfur, compared to a yield of 8.6 per cent from Sanandita crude and distillation shows a fuel-oil content of only 15.5 per cent. The Camiri field structure is anticlinal along the Sierra de Choreti and is traversed by the Rio Parapeti where a cross section is revealed in detail.

The first Camiri structure test drilled by Standard of Bolivia in 1926-27 found two productive zones at 3,133 and at 3,274 ft. The discovery was completed at 3,300 ft. for initial of 525 bbl. per day. The second test was abandoned at 1,480 ft., but the third, drilled in 1929-30, obtained production at 2,815 to 2,874 and at 3,094 ft.

Extremely high gas pressure was obtained from a zone between 1,365 and 1,555 ft. in the fourth Standard of Bolivia test and the hole was never carried into the oil section since conditions indicated the well was extremely high on structure.

Two wells are drilling under management of Y.P.F.B. Current production from the Camiri field is limited to about 315 bbl. per day which is the capacity of the nearby refinery.

The two refineries in Bolivia, Camiri in the Province of Cordillera, Department of Santa Cruz, and Sanandita in the Province of Gran Chaco, Department of Tariza, were originally built to meet the local requirements of Standard of Bolivia operations. Both are simple topping plants. During the Chaco conflict, the Camiri plant was enlarged to supply oil to the army. The entire present output, however, represents only 60 per cent of domestic needs for motor fuel.

Y.P.F.B. is planning the construction of a larger refinery with cracking equipment on the "altiplano" for national requirements and a smaller cracking plant at Santa Cruz for local demand.

Two short pipe lines figure prominently in the expansion plans by Y.P.F.B. One of the lines would be a 4-in. system extending 30 miles from Sanandita to Yacuiba at the Argentine border, or 10 miles further to Tobatirenda, the railroad terminal, if satisfactory arrangements can be made with the Argentina Government. The other pipe-line plan under consideration for future execution is a 45-mile system from Bermejo to Oran in the Argentine Republic. It is estimated that the cost of developing the Bermejo field to the projected production capacity of 6,300 bbl. per day and the pipe line would be in the neighborhood of $2,500,000.

There are no current withdrawals from the Bermejo field, but four out of nine wells drilled there have produced from 150 to 1,200 bbl. per day at depths ranging from 699 to 3,675 ft.

In addition to Sanandita, Camiri and Bermejo, three other Bolivian fields have been proven productive by one or more earlier wells. The Buena Vista area has one well capable of 40 to 50 bbl. daily from 3,166 ft. Three producers have been drilled in the Camatindi district to depths ranging from 2,346 to 4,806 ft. and output varied from 113 to 148 bbl. daily per well. One producer was completed out of two wells drilled in the Saipuru field and yield of 60 to 70 bbl. daily was developed between 2,073 and 2,730 ft.

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Maximum Stroke	24"	33"	32"	36"	54"

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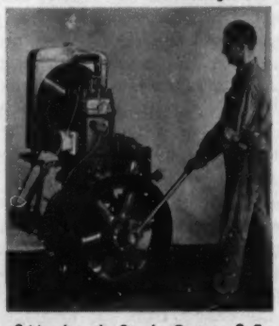

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A view of one of the big oil-storage depots at the Rumanian seaport of Constanza on the Black Sea, the great outlet for Rumanian commerce. Germany wants Rumanian oil. Russia would like it, too

Rumania Production Slightly Under 1938

DESPITE the demand on Rumania to produce every barrel of oil possible during the last 4 months, output for 1939 was 7 to 8 per cent under 1938 which was about 8 per cent less than 1937.

Pressure from Germany was particularly acute to increase overland and Danube River shipments. Rumania's dilemma asserted itself in various forms. One factor was the need of companies to deliver part of their exports to nations with strong currency. The Rumanian currency position has been difficult and regulations limiting export of capital continue a severe handicap. Currency restrictions make it difficult to acquire equipment for maintaining or expanding production. Still another factor is the nationality of the important producing companies. The largest producers are Rumanian subsidiaries of British, French and United States companies, doubtless a factor in negotiations for expanded trade with Germany.

There has been much discussion of revised petroleum laws and proposals were prepared in September to stimulate exploration but there has been no official change. The revisions would have modified restrictions on the acreage retainable around discoveries, but even under the proposed revisions the state reserved a substantial claim on acreage around discoveries.

Since expenditures by Rumanian companies are influenced by the management of parent companies capital investments have been subordinated to political considerations for several months. Doubt about Russia's intentions, combined with potential danger from the Reich if its petroleum position should become critical, make it unlikely Rumanian expenditures will be increased, certainly not beyond modest limits, while the war lasts. Recently a new agreement with Germany was reported, calling for immediate shipment of 75,000 bbl., and for an increase of 5 per cent in exports to the Reich, now restricted to 25 per cent of total Rumanian exports. But last week a further agreement was announced giving Germany almost half of the total Rumanian exports.

The first impact of higher prices and expanded demand, internally and for export, was felt in Rumania before the winter. Weather in December, January and February hampers oil-field activity. Upper portions of the Danube are clogged with ice for 90 to 120 days.

Drilling in the proven fields during 1939 was maintained at the 1938 rate. Slight and insignificant extensions were made. Two or three fairly large wells were completed in the old Baicoi field in Prahova, but insufficient to offset the normal decline.

The Tintea field is bracketed with Gura-Ocnitei as the most important fields. Tintea has daily average production of nearly 25,000 bbl. There are 18 drilling wells, but it is possible this is being expanded. Part of the field is operated under a unit agreement and even in other sections uniform spacing of 250 m., or about 820 ft., is observed. Wells in the south Meotic unit produce from around 8,800 ft. One well completed by Steaua Romana on acreage excluded from the unit operating agreement produced initially more than 20,000 bbl. daily.

The Gura-Ocnitei field in Dambovita averages 25,640 bbl. daily from 323 wells between 5,400 and 5,900 ft.

At the close of the year all Rumanian fields were credited with 2,261 producing wells yielding 128,196 bbl. There were 61 drilling operations, exclusive of wildcat exploration engaging less than 10 rigs.

Rumanian exports for the first 8 months of 1939 reported by the Bureau of Mines in International Petroleum Trade follow:

Commodity—	Barrels
Crude petroleum	1,756,000
Gasoline	9,840,000
Kerosene and white spirit	4,498,000
Gas oil	2,974,000
Fuel oil	3,511,000
Lubricating oils	196,000
Paraffin wax	34,000
Asphalt	75,000
Total	22,884,000

Availability of the Danube for movement to Germany lends interest to a review of the Danube tanker fleet consisting of about 300 boats normally transporting 7,200,000 bbl. annually. The registry, number and tonnage of the Danube tanker fleet is shown below:

Registry—	Boats	Tons
German	128	90,675
Yugoslav	42	31,711
Rumanian	56	26,857
British	30	22,369
Hungarian	15	10,408
French	14	9,742
Bulgarian	8	6,860
Belgian	2	1,500
Swiss	2	1,020
Netherland	1	173
Total	298	201,315

Intensive Exploration Due in the West Indies

INTENSIVE exploration of the islands making up the northern end of the West Indies, including Cuba, Haiti and the Dominican Republic, will be broadened in 1940. Operations are now under way to launch exploration work in Haiti.

Two producing wells have been completed on the Maleno structure by the Dominican Seaboard Oil Co. in a shallow zone around 475 ft., yielding a crude containing 36 per cent lubricating oil distillate and practically devoid of gasoline, kerosene, and other light fractions. The discovery well was completed late in July 1939, when the hole blew out at 1,100 ft. and eventually resulted in completion from the shallow horizon.

A second test was drilled on Maleno dome about 1,200 ft. from the discovery. Cavernous lime was encountered in the second test, causing a loss of rotary returns, and the rotary pipe eventually stuck requiring operators to shoot it off and plug back to the shallow oil zone. About 12 miles west of the Maleno structure, Dominican Seaboard is drilling a wildcat test at Quita Coraza which has reached the "big lime" at 3,290 ft. Operators planned to set 7-in. casing before continuing in the lime section, in an effort to avoid the mechanical difficulty encountered on both Maleno wells.

One of the two producing wells, the discovery at Maleno, is producing approximately 90 bbl. of oil per day, which is sufficient to meet fuel requirements on the deeper wildcat drilling operation. Based on outlay for imported fuel, the one producing well represents an income of approximately $5,000 per month.

Dominican Seaboard has two additional structures mapped on its holdings in the republic which are believed sufficiently well defined to justify testing, regardless of the outcome on the Quita Coraza structure.

East of Maleno dome, a concession known as Yaguate, consisting of approximately 160,000 acres, is held by Harold C. Bishop of New York, who is also a director of Dominican Seaboard Oil Co. Mr. Bishop will launch a core-testing program on the Yaguate structure in 1940, seeking confirmation of surface geological data.

In the adjoining country of Haiti, Mr. Bishop recently was granted a concession on approximately 3,000,000 acres for 50 years, subject to selections which must be made when the primary period of three years for exploration expire. Atlantic Refining Co., which has been active in Cuba for several years, has acquired an interest with Mr. Bishop in the Haitian concession. Geological exploration of Haiti is to start immediately. The Haitian concession lies in the Culdesac Valley around Hinche.

Dominican Seaboard Oil Co.'s No. 1 Quita Coraza

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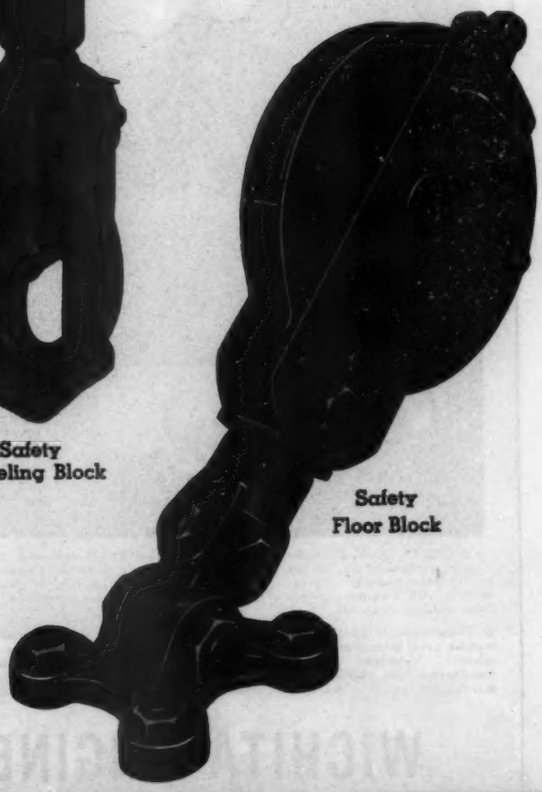

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Spectacular Rise Reported in Egypt This Year

EGYPT reported a spectacular rise in production this year, the output of 5,100,000 bbl. exceeding the 1938 yield by 207.19 per cent. This increase came exclusively from the new Ras Gharib field about midway between Suez and the Hurghada field. Anglo-Egyptian Oilfields, Ltd., controls the Ras Gharib field and maintained two diesel-powered rotary rigs in continual operation throughout the year. Ras Gharib production is obtained at approximately 2,500 to 3,500 ft. and wells flow 38° crude at the initial rate of 750 to 2,000 bbl. per day through choke.

Socony-Vacuum's Egyptian operating subsidiary has been active in exploratory drilling for a year and a half. The first wildcat prospect it drilled was at Dishet el Dhaba, about 250 miles south of Suez on the Red Sea, and a few miles south of the Hurghada field. The first test was drilled late in 1938 and encountered granite at about 2,000 ft. Equipment was transferred to an island called Giftun-Saghir, about 15 miles northeast, where the first test was drilled to 2,970 ft., where mechanical difficulties forced abandonment. A third test was drilled this year northwest of the Hurghada field.

All of the international oil companies increased their exploratory efforts in Egypt in keeping with the scope of land grants since the mining laws were revised in 1937. Companies active in Egyptian exploration include the Standard of California and Texas Co., Standard Oil Co. (New Jersey), Socony-Vacuum Oil Co., Inc., Anglo-Iranian Oil Co. and Royal Dutch-Shell. In some instances only cursory examinations have been made of land grants before the permits are returned to the government and new areas acquired. The rapid turnover of exploratory permits is due to the restrictions on the number of grants any one company can hold. The Department of Survey and Mines has increased the maximum number of permits available to any one company to 240, each of 100 sq. km., or 5,930,400 acres.

Heavier rotary equipment has been obtained for exploratory drilling in the coastal regions of French Equatorial Africa between Pointe Noir and Port Gentil. African and European Investment Co., Ltd., working from a technical standpoint in conjunction with Anglo-Iranian Oil Co., Ltd., is prosecuting a geological program in the vicinity of Lake Albert in Uganda. A deep test is being drilled on Waki Dome, near Butiaba. Plans call for core testing in the vicinity of Kibero.

Syndicate Petroleum Congo, Belge, has launched a shallow drilling-test program on the south side of Lake Albert in the Belgian Congo based upon geological findings of the Kilo Moto Mines which carried out an extensive program of investigation.

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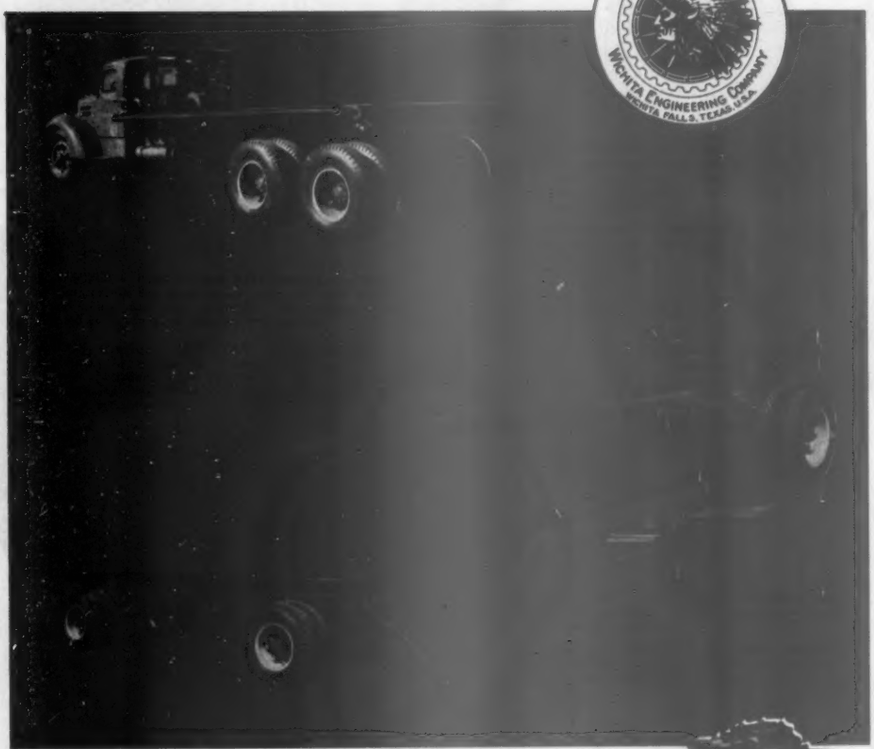

★WICHITA Split Propeller Shaft Power Take-Off—Winch and Walk type (power mechanism may be operated while vehicle is in motion). Variable speed—two forward and one reverse within power take-off which may be used in connection with transmission gears in either truck or tractor, resulting in an infinite number of speeds.

★ Tomafuerza WICHITA de árbol propulsor seccionado—tipo de montacarga y marcha (con mecanismo de fuerza en acción mientras el vehículo va en movimiento). Velocidad variable—dos hacia adelante y retromarcha, dentro del tomafuerza, que puede usarse en conexión con los engranajes del cambio de marcha del camión o del tractor, resultando e una infinidad de velocidades.

WICHITA ENGINEERING CO.

WICHITA FALLS, TEXAS, U.S.A.

Manufacturers and distributors of: Power Take-Offs, Tulsa Winches, Pumps, and other oil field equipment items.

Fabricantes y distribuidores de: tomafuerza, montacargas Tulsa, bombas y otros equipos para la industria petrolera.

Limited Exploitation in Ecuador During Year

EXPLOITATION and production in Ecuador was confined in 1939 to the Santa Elena peninsula, west of Guayaquil. Anglo-Ecuadorian Oilfields, Ltd.'s Ancon field on the southern side produces 95 per cent of Ecuadorian crude.

In the new Tigre field, east and north of Ancon, four producing wells, 150 bbl. each per day, were completed by Ecuador Oilfields, Ltd., subsidiary of British Controlled Oilfields, Ltd. Production is from 3,800 ft. in sand, correlating with the deeper oil zone at Ancon.

Exploration work included drilling several tests between the Tigre and the Ancon fields. East of La Libertad, drilling continued in Ecuador Oilfields' Cautivo field which has 85 wells drilled to approximately 1,000 ft. for completion in the Socorro sand which yields 30° crude.

The Socorro sand has been proven productive at El Tambo, separated from Cautivo by the town of Santa Elena. The four or five wells average 1,200 ft. and produce about 7 bbl. daily of 34° crude.

A chain of smaller fields across the neck of the Santa Elena peninsula is known as the Carolina area. Conditions are similar to Cautivo, but the output is around 200 bbl. daily, from 35 wells, depths ranging to 1,000 ft., but averaging little more than half that. The Ancon field has not been delimited, particularly east and northeast toward the Tigre and El Tambo fields. Exploration may open additional areas following a semicircular trend toward the northern coast east of La Libertad. The 41° crude oil from Ancon is moved by a 6-in. pipe line to La Libertad where Anglo-Ecuadorian operates a refinery, tank farm and sea loading terminal.

International Petroleum Co., Ltd., reentered Ecuador in 1937 acquiring approximately 500,000 acres from the government, extending from Cape San Lorenzo to beyond Monte Cristi and Jipi Japa. Exploratory work was carried out on the new concession this year.

At least two wildcat tests have been drilled on the San Gabriel grant east of Ancon by German interests represented by Otto Wolff, who acquired the holdings 2 years ago.

Canadian Gasoline Sales and Import Statistics

OTTAWA, Canada.—Canadian gasoline sales for the January-August period of 1939 totaled 506,240,000 gal. compared with 487,780,000 gal. in the same period last year, increases being shown in all nine provinces. For August, sales totaled 97,116,000 gal. against 90,562,000 gal. last year.

Imports into Canada of gasoline lighter than 0.8236 gravity in September totaled 10,444,166 gal., valued at $731,141, against 6,631,596 gal. worth $491,234 in August. Imports of natural casing-head, compression, or absorption gasoline lighter than 0.6690 gravity were 784,113 gal., valued at $54,656, in September, against 3,562,892 gal. worth $223,984 in August. Exports of gasoline and naphtha increased from 31,761 gal., valued at $4,953, in August to 492,288 gal. at $50,799 in September.

Imports of petroleum, asphalt, and their products into Canada in September totaled $5,901,699 value, a drop of 4.2 per cent from the August valuation of $6,158,099. Imports of crude petroleum in September consisted of 105,710,992 gal. from the United States, 16,745,000 gal. from Colombia, and 9,516,000 gal. from Venezuela. This compares with August imports of 125,465,279 gal. from the United States, 16,162,000 from Colombia, and 24,613,000 from Venezuela. Exports of petroleum products from Canada in September were valued at $111,744, compared with $54,851 in August.

Canadian Aviation Plans

TORONTO, Ont.—Development of Canada as a training ground for the Royal Air Force in the present war is expected to have a marked effect on oil production and refining in the dominion. While Canada's distance from the fighting area is expected to facilitate training, an important saving is also anticipated in gasoline transportation owing to Canada's proximity to the United States and South American producing areas. When plans are fully under way, a marked increase is expected in aviation-gasoline requirements.

United States authorities have estimated that about 500,000 lb., or approximately 70,000 gal. of gasoline are required to train a pilot for war service. Present plans call for speeding up the training, which is expected to materially reduce the fuel requirements, but an increased consumption of aviation gasoline is inevitable.

Crude and refined products can be moved to Canada conveniently by pipe line or tanker, and refining facilities are strategically distributed, permitting training in all parts of the dominion. At present, Canadian consumption of aviation gasoline is about 100,000 bbl. a year. Production will have to be stepped up, which will involve additional facilities for producing the higher grades of gasoline. Refiners are also expected to give attention to the production of still higher grades to meet the requirements of new types of planes.

ARGENTINA

(Continued from Page 72)

As the proportion in which the state's areas and those of the private companies shared in the total Argentine production was not a constant one, the following table gives the figures corresponding to the last 5 years, and shows how the Y.P.F. production has gained right along to the point where, in 1938, it exceeded that of private companies:

Year—	Government production (cu. m.)	Private production (cu. m.)	Total (cu. m.)
1934	835,564	1,394,150	2,229,714
1935	943,846	1,329,131	2,272,977
1936	1,140,191	1,317,354	2,457,545
1937	1,261,899	1,338,208	2,600,107
1938	1,430,599	1,284,224	2,714,823

Note: One cubic meter equals 6.2905 U. S. bbl.

The total for 1938 came to 2,714,823 cu. m.

Let CLEVELANDS STREAMLINE Your DITCHING and BACKFILLING COSTS

"Cleveland" has successfully eliminated wasteful dead weight, with its attendant clumsiness—and *simultaneously*, increased performance, in these two recent additions to its line, here illustrated.

Leading pipeline companies and contractors recognize this achievement by purchasing Clevelands for use on current projects in the U. S. and foreign countries.

Only Clevelands give you that well-balanced combination of dependability, speed and maneuverability which streamlines your ditching and backfilling operations, resulting inevitably in lower job costs.

The Cleveland "Model 140" (illustrated above) is the toughest, fastest and most dependable "Cleveland" ever built. The Model 140 has new, wide tread; longer, wider crawlers; increased ground clearance and wider digging widths (ranging from 18" to 30"). New "Multi-Speed" crawler transmission X-braced frame, box-member boom, 100% fabrication from hi-strength steel, and many other advantageous features.

Complete the Job with—
"CLEVELAND" Model "90" BACKFILLER and PIPE-CRANE

The Cleveland Model "90," Backfiller and Pipe-Crane is revolutionizing backfilling methods. A universal machine, handles backfilling on small or large diameter lines. No dirt too heavy. No crop-damage. Fills 2 to 3 miles per day, even in rough country. Lowers in slack-loops, eliminating need for separate piece of equipment. Diesel or gasoline-powered. The only One Man Operated, Continuous-Travel Backfiller on the market.

Here, in these two latest "Clevelands" is soundly engineered equipment, ultra-modern in design, backed by a quality of construction that is without equal. They assure you of long life, resistance to wear and abuse—dependability. Let us prove to you how new, modern equipment will save you real money. We solicit your inquiry.

One important "Cleveland" idea that adds to the versatility of performance is illustrated at the right—low cost transportation, at truck speed, via special trailer—"Clevelands" load or unload in 10 to 15 minutes.

THE CLEVELAND TRENCHER CO.
"Pioneer of the Small Trencher"
20100 St. Clair Ave. Cleveland, Ohio

(17,077,594 bbl.); of this quantity, 1,430,599 cu. m. (8,991,183 bbl.) were produced under government auspices, and the remaining 8,078,411 bbl. were the production of private companies.

Nor has there been any uniformity in the respective contributions of the four areas now under development in the Argentine. As in previous years, the greatest production was that of the Comodoro Rivadavia region, the place where operations were started earliest and where development has reached its highest point. As indicated by the following table, the Comodoro Rivadavia production represented 82.6 per cent of the country's total in 1938:

Year—	Comodoro Rivadavia (cu. m.)	Pl. Huincul (cu. m.)	Salta and Jujuy (cu. m.)	Mendoza Province (cu. m.)	Ttl. for country (cu. m.)
1934	1,725,485	172,504	323,287	8,438	2,229,714
1935	1,813,506	146,494	304,162	8,538	2,272,700
1936	1,996,823	166,182	281,645	12,895	2,457,545
1937	2,131,343	156,592	294,250	17,908	2,600,107
1938	2,243,340	156,881	282,624	31,978	2,714,823

Note: One cubic meter equals 6.2905 U. S. bbl.

Although still in the initial period of exploitation, the oil fields in the Province of Mendoza, where production was started in 1933, will, by some time in the present year, be producing approximately 4 per cent of the country's total.

Refining Operations

As was to be expected, the development of oil production has proceeded pari passu with the manufacture of petroleum derivatives in the country's various refining plants, in which connection it may be pointed out that these have been handling not only the crude of domestic production but also (though to a lesser extent) the imported article.

The following figures show the quantities of crude handled by Argentine refining plants during the year 1938 and the first half of 1939:

	1938 (cu. m.)	1st 6 mo. 1939 (cu. m.)
Argentine crude	2,762,141	1,474,255
Imported crude	783,769	429,653
Total	3,545,910	1,903,908

The following are the figures for the quantities of the main derivatives obtained:

	1938 (cu. m.)	1st 6 mo. 1939 (cu. m.)
Gasoline	1,217,148	708,019
Kerosene	206,071	107,925
Gas oil	118,362	62,516
Diesel oil	296,512	149,036
Fuel oil	1,370,536	646,083
Lubricating oils	60,416	35,150
Asphalts	36,623	18,143
Turpentine and miscellaneous	9,905	6,712

In addition to the derivatives above listed, other articles manufactured by these plants have met with a good sale on the market—a special fuel oil for use on farm machinery, specialty oils, wax, liquid gas, insecticides.

Domestic Consumption

The requirements of domestic consumption have entirely absorbed the quantities produced at the refining plants, and there has also been some importation of crude petroleum and derivatives from abroad. It should be pointed out, however, that gasoline imports, which amounted to 28,510 cu. m. in 1937, dropped to only 2,759 cu. m. in 1938, and that in the latter year the importation of kerosene was only 7 cu. m.

The following are the consumption figures for the principal petroleum products during 1938 and first half of 1939:

	1938 (cu. m.)	1st 6 mo. 1939 (cu. m.)
Fuel oil	2,222,432	1,165,271
Diesel oil	619,840	295,827
Gas oil	139,884	70,930
Lubricating oils	68,523	35,349
Gasoline	1,197,925	650,397
Kerosene	201,048	91,859

Among new items of refining equipment at existing plants may be mentioned the new combination unit, the operation of which was inaugurated by the Y.P.F. at the La Plata refinery in the month of September. This unit is used for topping, cracking reduced crude, cracking heavy gas oil and light gas oil, and treating gasoline in the vapor phase, and it also comprises a thermal polymerization plant, daily charging capacity 1,500 cu. m.

The polymerization plant of the above unit will, in addition to treating the gas produced in connection with the handling of the 1,500 cu. m. charge, treat an additional 10,000 cu. m. of propane and butane obtained at the other existing installation of the same refinery.

The unit has been designed so as to allow of the manufacture of gas oil and intermediate products, when necessary.

The Y.P.F. also started construction during the present year on two new refining plants equipped with combined topping and cracking units, one located near the city of Salta, capital of the province of the same name, with a capacity of 300 cu. m. of crude per day with a 30 per cent gasoline content, by the straightrun process; the other in Lujan de Cuyo (Province of Mendoza), with a capacity of 500 cu. m. of crude from the new Tupungato field.

Both these new plants are designed to produce light and heavy fuels—gasoline, kerosene, gas oil, diesel oil, and fuel oil.

RECLAIM MUD AND *mud-weighting material*

with the NEW MERCO DESANDER

Reclaiming of rotary drilling mud with the new low cost Merco Type A-24 Desander is truly economical, thorough and highly efficient. The MERCO makes satisfactory separation of sand and cuttings on practically any drilling mud at the through-put capacity of the machine, which is 350 gallons per minute. For average drilling muds at the capacity of 350 gallons per minute, less than 1% of plus 100 mesh sand remains in the mud, while less than 3% of plus 200 mesh sand remains. With muds of lower viscosity, such as dispersed muds, the plus 200 mesh sand remaining in the treated mud is less than 1% at a feed of 350 gallons per minute.

Light in weight, compact, reasonable in price, the new MERCO Centrifugal Desander more than repays its low initial investment, by effecting substantial savings in rotary drilling mud, weighting materials, transportation costs and equipment wear. In addition to these important savings, it insures against such hazards as stuck pipe and casings, "twist-offs", "blow-outs", etc.

ASK ABOUT MERCO'S NEW PROCESS of Clean Dry Recovery of Weighting Material from Mud...for Re-Use by Centrifuging and Flotation.

WRITE TODAY!

MERCO

Free Booklet Available on "The New Improved Method of Conditioning Rotary Drilling Mud."

CONCENTRATING MUD-WEIGHTING MATERIALS IN THE MUD

Another extremely valuable use of the Merco Desander is the maintaining of proper weight in the mud by removing colloids, water and gas, and concentrating mud-weighting materials, which are remerged with the circulating mud. The savings in costly and otherwise wasted mud-weighting materials are obvious. Write today for complete information and prices.

THE NEW IMPROVED

MERCO *centrifugal* DESANDER

TYPE A-24

Merco Centrifugal Company

Division (A), 343 Sansome St., San Francisco, Calif.

MERCO CENTRIFUGAL CO.
Dept. A, 343 Sansome Street
San Francisco, California

Please send me without obligation:

- FREE booklet on the Conditioning of Mud . . . . . ☐
- Price of the new Type A-24 Desander . . . . . ☐
- Information on Merco's DRY RECOVERY Process . . ☐

Name_____

Address_____

City_____ State_____

(Left) On the docks at New Orleans Columbian Bolted Tanks wait to be slung into the ship's hold.

COLUMBIAN STEEL TANK CO.

"TANKS FOR THE WORLD"

KANSAS CITY, MO. U.S.A.

COLUMBIAN STEEL TANK CO. K.C. MO. COP-NIC COPPER-NICKEL ALLOY "TANKS FOR THE WORLD"

A battery of Columbian Cop-Nic Tanks in the sour crude district.

WHEREVER oil is produced you'll find Columbian Bolted Steel Tanks predominating because Columbian has attained a distinct leadership in superior tank design and construction.

This leadership was proved again when Columbian laboratories perfected COP-NIC with a special galvanized coating for Columbian Bolted Tanks, which makes them highly resistant to corrosive action and perfect for use in sour crude districts.

The sheets from which these tanks are made are of selected base material. An exclusive galvanizing process is used to put on a heavy coating of zinc spelter which is applied in such a manner as to become virtually a part of the steel itself, minimizing the possibility of any pitting or loosening of the coating. The unusual results obtained with these COP-NIC Galvanized Tanks are attributed to the process used in preparation of the sheets, of the coating, and the manner of fabrication which does not destroy or render ineffective the galvanized coating.

FREE—*32-Page Catalog*—Protect your tank investment with Columbian COP-NIC Tanks. Check the coupon at right now for your copy of the Columbian Catalog full of actual photographs, and information of interest to every oil man.

COLUMBIAN STEEL TANK CO.

P. O. BOX G-4226 KANSAS CITY, MO.

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Please send me information on the following:
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FIRM NAME _____

ADDRESS _____

CITY _____

STATE _____

WORLD OIL-REFINERIES SURVEY

(Continued from Page 79)

GERMANY
(Austria)

Company and address—	Plant location	Superintendent	Crude capacity (bbl. dly.)	Type of refinery	Cracking equip. Capacity (bbl. dly.)	Cracking equip. Type	Operating status
Creditul Minier Oesterreichische-Rumanische, Petroleum-Vertriebs-Gesellschaft, Bulevardul Bratianu 16, Bucarest	Korneuburg	C. Stoicescu	2,400	.....	None	None	Op.
Creditul Minier Oesterreichische-Rumanische, Petroleum-Vertriebs-Gesellschaft, Bulevardul Bratianu 16, Bucarest	Droesing	C. Stoicescu	1,000	.....	None	None	Op.
Oesterreichische Fanto, A.G., Herrengasse 17, Vienna	Lanzendorf	.....	1,120	.....	None	None	Op.
Aktiengesellschaft der Shell-Floridsdorfer-Mineralolfabrik, Schubert-ing 14, Vienna, 1	Floridsdorfer	.....	2,000	.....	750	.....	Op.
Vacuum Oil Co., A.G. (Vienna), Schwarzenbergplatz 18, Vienna	Kagran	Otto Griffa	1,500	.....	None	None	Op.
Total Austria			8,020		750		

GERMANY
(Old Reich)

Danubia A.G. Fur Mineraloel-Industrie, Wiener Str. 18, Regensburg	Regensburg	.....	500	.....	None	None	Op.
Deutsche Erdol Raffinerie A.G., Martin Lutherstrasse 61-66, Berlin	Misburg	.....	5,000	.....	2,500	Dubbs	Op.
Deutsche Gasolin A.G., Adolph Hitlerplatz 7-11, Berlin	Emmerich	.....	1,200	.....	None	None	Op.
Deutsche Gasolin A.G., Adolph Hitlerplatz 7-11, Berlin	Dollbergen	.....	800	.....	None	None	Op.
Deutsche Petroleum Aktiengesellschaft, Martin Lutherstrasse 61-66, Berlin	Hamburg	E. Baver	1,200	.....	None	None	Op.
Deutsche Petroleum Aktiengesellschaft, Martin Lutherstrasse 61-66, Berlin	Hannover	K. Grosse	300	.....	None	None	Op.
Deutsche Petroleum Aktiengesellschaft, Martin Lutherstrasse 61-66, Berlin	Rheinau	M. Heyne	150	.....	None	None	Op.
Deutsche Petroleum Aktiengesellschaft, Martin Lutherstrasse 61-66, Berlin	Regensburg	Dr. H. Hase	500	.....	None	None	Op.
Deutsche Vacuum Oel, A.G., Semperhaus B, Spitalerstrasse 10, Bremen	Bremen	Dr. W. Knudsen	1,000	.....	None	None	Op.
Ebano Asphalt-werke A.G., Never Jungfernstieg 21, Hamburg, 36	Harburg	Dr. D. Lohmann	8,000	S-A	None	None	Op.
Wintershall, A.G., Hohenzollernstr., 139, Kassel	Durchsatz	.....	1,000	.....	None	None	Op.
"N.I.T.A.G." Internationale Tiefbohr A.G.	Petroleumhafen	.....	8,000	.....	2,500	Winkler-Koch	Op.
Loeb, Max, Benzin-Benzole-Mineralolwerke, Koln-Braunsfeld, Koln Braunsfeld	Koln-Braunsfeld	.....	200	.....	None	None	Op.
Mineraloiel und Asphaltwerke A.G., Jungfernsteig 7, Hamburg, 36	Ostermoor	W. Bove	2,500	.....	None	None	Op.
Norddeutsche Mineralol A.G., Hannover	Dollbergen	.....	200	.....	None	None	Op.
Oelwerke Julius Schindler, G.m.b.h., Hohe Bleichen 28, Hamburg, 36	Neuhof, Pelne	C. W. Buente-K. Albrecht	700	.....	None	None	Op.
Rhenania-Ossag Mineralolwerke A.G., Shell-Haus, Alster-Ufer 4-5, Hamburg, 36	Monheim	Dr. W. Kruspig	2,000	S-L	None	None	Op.
Rhenania-Ossag Mineralolwerke A.G., Shell-Haus, Alster-Ufer 4-5, Hamburg, 36	Hamburg-Grasbrook	Dr. W. Kruspig	2,000	S-L	None	None	Op.
Rhenania-Ossag Mineralolwerke A.G., Shell-Haus, Alster-Ufer 4-5, Hamburg, 36	Harburg-Wilhelmsb'g	Dr. W. Kruspig	5,000	S-L-A	None	None	Op.
Rhenania-Ossag Mineralolwerke A.G., Shell-Haus, Alster-Ufer 4-5, Hamburg, 36	Harburg-Wilhelmsb'g	Dr. W. Kruspig	1,200	S	None	None	Op.
Rhenania-Ossag Mineralolwerke A.G., Shell-Haus, Alster-Ufer 4-5, Hamburg, 36	Reisholz-Dusseldorf	Dr. W. Kruspig	1,200	S	None	None	Op.
Rhenania-Ossag Mineralolwerke A.G., Shell-Haus, Alster-Ufer 4-5, Hamburg, 36	Freital-Dresden	Dr. W. Kruspig	200	L	None	None	Op.
Rhenania-Ossag Mineralolwerke A.G., Shell-Haus, Alster-Ufer 4-5, Hamburg, 36	Regensberg	Dr. W. Kruspig	300	S	None	None	Op.
Schliemann's Ernest Oelwerke, Gesellschaft, Mit Beschrankter Haftung, Catharinestr., 38-39, Hamburg	Wilhelmsburg	.....	100	L	None	None	Op.
Schliemann's Ernest Oelwerke, Gesellschaft, Mit Beschrankter Haftung, Catharinestr., 38-39, Hamburg	Hamburg	.....	300	S-L	None	None	Op.
Westfalische Mineraloel und Asphalt-werke, Lange Reihe 43, Dortmund	Dortmund-Sud	.....	300	S-L	None	None	Op.
Mineraloel-Raffinerie Vorm, August Korff, Stephanikirchenweide 20, Bremen	Bremen	.....	500	L	None	None	Op.
Mineraloelwerke Lichtenberg, G.m.b.h., Komm-Ges., Jagerstr. 61, Berlin, W.8	Lichtenberg	.....	1,000	S-C	250	.....	Op.
Ruhrbenzol, G.m.b.h., Herner Str. 234, Bocum	Holten	.....	2,000	S-C	820	Dubbs	Op.
Zeller & Gmelin, Fislinger	Eislingen	.....	100	S-A	None	None	Op.
Twelve miscellaneous specialty and small topping plants	.....	.....	1,500	.....	None	None	Op.
Total Old Reich			48,450		6,070		

HUNGARY

Hazai Koolajipar Reszvemutarsasag 5, Nadorutca 7, Budapest	Budapest	Geza Komlos	1,000	S-L	None	None	Op.
Nyirbogdanyi Petroleumgyar Reszvemtargagsag, Andrassy-ut 2, Budapest, 6	Nyirbogdany	Laszlo Barta	300	S-L	None	None	Op.
Shell Kaolaj Reszvemutarsasag 5, 5/6 Jozsef nador ter, Budapest	Budapest-Csepel	A. J. Madlener	3,850	S-L	None	None	Op.
Fanto Associated Hungarian Oil Co., Ltd., 3/4 Jozsef nador ter, Budapest 5	Budapest	.....	1,100	S-L	None	None	Op.
Vacuum Oil Co. R.T., V. Zrinyi-ucca 7, Budapest, 5	Fuzito	Alexander Schwarz	3,800	L-W-A	None	None	Op.
Magyar Hydrobenzin Reszuenytarsasag, D. Nador-Utca, Budapest	Petfurdo	.....	1,200	S-C	350	Dubbs	Op.
Szoreger Petroleumfabrik A.G.	Szoreg	.....	420	S	None	None	Op.
Total Hungary			11,670		350		

INDIA

Assam Oil Co., Ltd., Brittanic House, Finsbury Circus, E.C. 2, London, England	Digboi	.....	6,000	.....	2,100	Dubbs	Op.
Attock Oil Co., Ltd., 6 Fenchurch Ave., E.C. 3, London, England	Rawalpindi	E. S. Millar	4,000	.....	2,500	Dubbs	Op.
British Burmah Petroleum Co., Ltd., 5 and 6 Queen St. Place, E.C. 4, London, England	Rangoon	.....	2,500	S-C	2,000	Cross	Op.
Burmah Oil Co., Ltd., 175 West George Street, Glasgow, Scotland	Rangoon	.....	20,000	.....	3,000	Dubbs	Op.
Indo-Burma Petroleum Co., Ltd., 622 Merchant St. (Box 1059), Rangoon	Seikgri	H. Roper	3,500	S-C	1,000	.....	Op.
Indo-Burma Petroleum Co., Ltd., 622 Merchant St. (Box 1059), Rangoon	Kindat	H. Roper	500	S	None	None	Op.
United Refineries, Ltd.	Thilwa	.....	500	S	None	None	Op.
Total India (British India-Burma)			37,000		10,600		

IRAN

Anglo-Iranian Oil Co., Ltd., Britannic House, Finsbury Circus, E.C. 2, London, England	Abadan	J. M. Pattinson	280,000	Comp.	125,000	Cross	Op.
Kermanshah Petroleum Co., Ltd., Britannic House, Finsbury Circus, E.C. 2, London, England	Kermanshah	.....	3,000	S	None	None	Op.
Anglo-Iranian Oil Co., Ltd., Britannic House, Finsbury Circus, E.C. 2, London, England	Bandar Shapur	.....	50,000	S-C	30,000	.....	Bldg.
Total Iran			333,000		155,000		

IRAQ

Iraq Petroleum Co., Ltd., City Gate House, Finsbury Circus, E.C. 2, London, England	Baba Gurgur	A. J. Pirks	1,500	S	None	None	Op.
Iraq Petroleum Co., Ltd., City Gate House, Finsbury Circus, E.C. 2, London, England	Kirkuk	.....	*100,000	.....	None	None	Op.
Khanaquin Oil Co., Ltd., Britannic House, Finsbury Circus, E.C. 2, London, England	Aldwan	J. Startup	2,500	S	None	None	Op.
Total Iraq (exclusive of stabilization plant)			4,000				

*This is a stabilization plant particularly designed to remove the H_2S.

IRELAND

Company and address—	Plant location	Superintendent	Crude capacity (bbl. dly.)	Type of refinery	Cracking equip. Capacity (bbl. dly.)	Cracking equip. Type	Operating status
Irish National Refineries, Ltd., 11 Stephens Green, C. 2, N. Dublin; 9 St. Helen's Place, E.C. 2, London	Dublin	E. L. Lomax	10,000	S-L	None	None	Bldg.
Cork Harbour Oil Wharves, Ltd., 22 Orchard St., W. 1, London, Eng.	Haulbowline	J. H. Varley	600	.....	None	None	Op.
Total Ireland			10,600				

ITALY

"Aquila" S.A. Tecnico-Industriale, Casella Postale 82, Trieste	Trieste	Dott. S. Albonetti	5,000	S-L	None	None	Op.
Azienda Generale Italiana Petroli, Via Tritone 181, Rome	Venice	Count E Carafa d'Andria	6,000	S-C	3,100	Dubbs	Op.
Distillazione Italiana Combustibili S.A., San Polo—2004, Venice	Porto Maghera	Dr. Giorgio	5,000	S-C	3,500	Dubbs	Op.
Raffineria di Olii Minerili (A.G.I.P.), C. Vittorio Emanuele 18, Fiume	Fiume	Ing. Felice Epstein	2,500	S-L-W	None	None	Op.
Raffineria de Napoli S.A.I. (Socony-Vacuum), Via Vittorio Veneto 7, Rome	Naples	F. Terrizzani	5,500	.....	4,000	Houdry-Dubbs	Op.
Societa Petrolifera Italiana, Fornovo Taro (Parma) Italy, Rome	Fornova Taro	V. Cambi	1,000	S	None	None	Op.
Standard Societa Italo Americana pel Petrolio, 40 Via Assarotti, Genoa	Trieste	O. Krischai	2,500	L-A	None	None	Op.
Societa per Industria Italiana del Petrolio (subsidiary of Nafta Societa Italiana pel Petroleio ed Affini), Piazza della Vittoria, Genoa	Spezia	A. de Graan	5,000	S-C	4,000	Dubbs	Op.
Azienda Nazionale Idrogenazione Combustibili, Via Fatebenefratelli, N. 7, Milan	Bari	.....	4,400	.....	2,000	Hydrogenation	Op.
	Leghorn	.....	4,400	.....	2,000	Hydrogenation	Op.
Total Italy			41,300		14,600		

JAPAN

Aikoku Oil Co., Kawaski, Kanagawa	Kawasaki	.....	2,000	S-C	1,000	None	Op.
Asahi Sekiyu Kabushiki Kaisha (Ashi Petroleum Co., Ltd.), No. 6 Itchome, Marunouchi, Kojimachi-Ku, Tokyo	Tokyo	.....	500	S	None	None	Op.
Asahi Sekiyu Kabushiki Kaisha (Ashi Petroleum Co., Ltd.), No. 6 Itchome, Marunouchi, Kojimachi-Ku, Tokyo	Hikoshima, Jamaguchi	.....	500	S	None	None	Op.
Hayama Oil Co., Sekiya, Niigata	Kawasaki	.....	2,000	S-C	1,000	None	Op.
Imperial Japanese Navy	Kudamatsu	.....	3,000	S-C	1,500	None	Op.
Chosen Sekiyu Kaisha, Genzan, Korea	Genzan	.....	5,000	Comp.	1,250	Cross	Op.
Mitsubishi Oil Co., Ltd., Yaesu Building, Marunouchi, Tokyo	Kawasaki	C. T. Tsunoda	5,000	S-C	4,000	Cross	Op.
Nippon Oil Co., Ltd., Yuraku-Kan, Marunouti, Tokyo	Amagasaki	.....	4,000	S-C	1,500	None	Op.
Nippon Oil Co., Ltd., Yuraku-Kan, Marunouti, Tokyo	Kashiwazaki, Niigata	.....	2,800	S	None	None	Op.
Nippon Oil Co., Ltd., Yuraku-Kan, Marunouti, Tokyo	Niigata	.....	2,800	S-C	1,000	Cross	Op.
Nippon Oil Co., Ltd., Yuraku-Kan, Marunouti, Tokyo	Akita	.....	4,000	S	None	None	Op.
Nippon Oil Co., Ltd., Yuraku-Kan, Marunouti, Tokyo	Tsurumi, Kanagawa	.....	6,000	Comp.	1,000	Dubbs	Op.
Nippon Oil Co., Ltd., Yuraku-Kan, Marunouti, Tokyo	Kudamatsu, Ya'aguchi	.....	4,000	Comp.	1,000	Cross	Op.
Nippon Oil Co., Ltd., Yuraku-Kan, Marunouti, Tokyo	Karukawa, Hokkaido	.....	300	S	None	None	Op.
Nippon Oil Co., Ltd., Yuraku-Kan, Marunouti, Tokyo	Byoritsu, Taiwan	.....	200	S	None	None	Op.
Ogura Oil Co., Ltd., Kobunacho, Nihonbashi-ku, Tokyo	Ysurumi, Kanagawa	.....	7,000	S-C	1,000	Cross	Op.
Ogura Oil Co., Ltd., Kobunacho, Nihonbashi-ku, Tokyo	Tokyo-Oshima	.....	3,500	S-C	2,000	Jenkins-Cross	Op.
Total Japan			52,600		16,250		

JAVA

de Bataafsche Petroleum Maatschappij (Shell), Carl van Bijlandtlaan, 30, The Hague	Wonokromo	.....	2,500	S	None	None	Op.
de Bataafsche Petroleum Maatschappij (Shell), Carl van Bijlandtlaan, 30, The Hague	Tjepoe	.....	14,000	S-C	600	Dubbs	Op.
Nederlandsche Koloniale Pet. Mij. (Standard-Vacuum), Gebouw Petrolea, P. O. Box 109, The Hague	Kapoen	.....	500	S	None	None	Op.

LATVIA

A. Oehlrich & Co., Ltd.	Muehlgraben (near Riga)	.....	200	S	None	None	Op.
Total Latvia			200				

LIBYA

Raffinera di Olii Minerali per L'Africa del Nord Anonima, Tripoli			2,000	.....	....	.....	Op.

MANCHUKUO
(Manchuria)

Manchukuo-Japan Oil Co., Hsinking	Dairen	.....	3,000	S-C	850	Dubbs	Op.
Total Manchukuo			3,000	.....	850		

MEXICO

Petroleos Mexicanos, Av. Juarez 92-94, Mexico City, D.F.	Ciudad Madero	R. Viesca Arizpe	37,500	Comp.	17,000	Dubbs-Gyro	Op.
Petroleos Mexicanos, Av. Juarez 92-94, Mexico City, D.F.	Arbol Grande	J. Avina	10,100	Comp.	1,100	Dubbs	
Petroleos Mexicanos, Av. Juarez 92-94, Mexico City, D.F.	Bella Vista	B. Grajales	1,400	S-A	None	None	Op.
Petroleos Mexicanos, Av. Juarez 92-94, Mexico City, D.F.	Pueblo Viejo		6,500	S-A	None	None	Op.
Petroleos Mexicanos, Av. Juarez 92-94, Mexico City, D.F.	Poza Rica	R. de la Fuente	8,000	S-A	None	None	Op.
Petroleos Mexicanos, Av. Juarez 92-94, Mexico City, D.F.	Minatitlan	L. Torres	18,000	Comp.	3,000	Dubbs	Op.
Petroleos Mexicanos, Av. Juarez 92-94, Mexico City, D.F.	Mexico City	F. Aznar	14,500	Comp.	8,000	Kellogg	Op.
Meza Moreno Teodoro	Pac. y Aguacate	.....	315	S	None	None	Op.
Refinerias Mexico	Nuevo Laredo	.....	330	S	None	None	Op.
Refineria Villarreal	Nuevo Laredo	.....	50	(*)	None	None	Op.
Refineria Laredo	Nuevo Laredo	.....	190	S	None	None	Op.
Refineria Union	Monterrey	.....	160	S	None	None	Op.
Refineria Del Norte	Ciudad Juarez	.....	1,000	S	None	None	Op.
Total Mexico			98,045		29,100		

*This is an experimental plant. Note—Virgilio Sanchez is general manager of refineries for Petroleos Mexicanos.
Note—Capacity figures supplied by government sources. Capacity was previously considered about 165,000 bbl. daily.

NETHERLANDS

N. V. de Bataafsche Petroleum Maatschappij (Shell), Carl van Bijlandtlaan 30, The Hague	Rotterdam	.....	15,000	S-A-C	12,500	Dubbs	Op.
Total Netherlands			15,000		12,500		

NETHERLAND EAST INDIES
Borneo

de Bataafsche Petroleum Maatschappij (Shell), Carl van Bijlandtlaan 30, The Hague	Balikpapan	.....	35,000	Comp.	7,400	Dubbs	Op.

NETHERLAND WEST INDIES
(Aruba)

Arend Petroleum Maatschappij, Willemstad, Curacao	Bruif, Aruba	.....	20,000	S-C	2,200	Dubbs	Op.
Lago Oil & Transport Co., Ltd., Toronto, Ontario, Canada	Aruba	L. G. Smith	285,000	.....	240,000	Comb. visbr.	Op.
(Curacao)							
Curacaosche Petroleum Industrie Mij., Carl van Bijlandtlaan 30, The Hague	Emmastad	Dr. van N. Schonegevel	200,000	.....	96,000	Dubbs-Cross	Op.
Total Netherland West Indies			505,000		338,200		

NORWAY

A. S. Norsk Amerikansk Mineroloiljecompagni, Kongensgate 18, Oslo	Valio	S. Launy	1,200	L-A	None	None	Op.
Total Norway			1,200				

PALESTINE

Company and address—	Plant location	Superintendent	Crude capacity (bbl. dly.)	Type of refinery	Cracking equip. Capacity (bbl. dly.)	Cracking equip. Type	Operating status
Consolidated Refineries, Ltd., Britannic House, Finsbury Circus, E.C. 2, London, England	Haifa	L. W. Chuter	40,000	Comp.	20,000	Kellogg	Bldg.
Total Palestine			40,000		20,000		

PERU

Establecimiento Industrial de Zorritos, Apartado 130, Calle Constitucion 25, Callao	Zorritos	.....	1,000	.....	None	None	Op.
International Petroleum Co., Ltd., 56 Church St., Toronto, Sarnia, Ontario, Canada	Talara	G. E. Kent	20,000	.....	6,800	Tube & Tank	Op.
Compania de Petroleo Ganso Azul, Ltda.	Aguas Calientes	.....	1,000	.....	None	None	Bldg.
Total Peru			22,000		6,800		

PORTUGAL

Soc. Concessionaire pour le Refinacao de Petrole en Portugal, 57 rua do Alecrim, Lisbon	Lisbon (Cabo Ruivo)	.....	4,000	S-C-L	1,500	.....	Op.

POLAND
(Now Russian and German)

Galicyj-ski Towarzystwo Naftowe "Galicja," S.A., 26 Batorego, Pl. Marjacke 8, Lwow	Drohobycz	Joseph Metzis	3,000	Comp.	1,000	Cross	Op.
Galizische Karpathen Petroleum A.G., 26 Batorego, Pl. Marjacke 8, Lwow	Jedlice	.....	1,200	S-L	None	None	Op.
Galizische Karpathen Pet. A.G., 26 Batorego, Pl. Marjacke 8, Lwow	Dziedzice	.....	1,200	S-L	None	None	Op.
"Gazy Ziemne" Spolka Akcyjna dla Przemyslu Naftowego I Gazow Zem, Akademick 7, Lwow	Zniesienie (n. Lwow)	.....	1,000	S-L	None	None	Op.
"Nafta" Spolka Akcyjna, 26 Batorego, Pl. Marjacke 8, Lwow	Drohobycz	.....	1,200	S-L	None	None	Op.
Jaslo, Industrial Oil Works, Nieglowice ad Jaslo, Jaslo	Nieglowice	A. Z. Blumenthal	1,500	S-L	None	None	Op.
"Limanowa" (Towarzystwo Naftowe Spolka Z. Org. Odp., Boryslaw	Limanowa	Ludwig Muller	2,000	S-L-A	None	None	Op.
"Polmin" State Oil Works, Akademick 7, Lwow	Drohobycz	Zygmunt Bilioúchowski	3,500	S-C-L	1,000	Dubbs	Op.
"Polskie Zwiazkowe Refiner je Alejow Skanych" (Polish United Oil Refineries), 26 Batorego, Pl. Marjacke 8, Lwow	Rychcice, Drohobycz	.....	800	S-L	None	None	Op.
"Polskie Zwiazkowe Refiner je Alejow Skanych" (Polish United Oil Refineries), 26 Batorego, Pl. Marjacke 8, Lwow	Trzebinia (Cracow)	.....	1,500	S-L	None	None	Op.
Rafinerja Nafty "Gleboka" Spolka Z.O.O., Gleboka	Gleboka (Sambor)	.....	100	S	None	None	Op.
Rafinerja Nafty Fabryka Olejow, Maszynowych M. H. Reich I Ska, Stryj	Stryj	.....	250	S	None	None	Op.
Rafinerja Skawinska Zaklady Dla Przemyslu Oleju Skalnego, Griffel I Ska, Skawina	Skawina	.....	300	S	None	None	Op.
Spolka Akcyjna Fanto, Place Maryacki 8, Lwow	Ustrzyki Dolne	.....	1,000	S	None	None	Op.
Standard Nobel Co. in Poland, Ltd., Warsaw	Libusza	.....	1,200	S-L	None	None	Op.
Vacuum Oil Co., S.A., Post-Dziedzice, Warsaw	Czechowice, Silesia	.....	1,600	S-L-W	300	Cross	Op.
Rafinerja Olejow Mineralnych "Segli" Spolka, Nadworna	Nadworna	.....	200	S	None	None	Op.
Stawiarski, R. W. & Co., Krosno	Krosno	.....	500	S	None	None	Op.
Ten other small plants			1,000	S	None	None	Op.
Total Poland			23,050		2,300		

RUMANIA

Astra Romana S.A. (Shell), No. 32 Boulevard Regele Carol 1, Bucarest	Ploesti	E. Pfister	40,000	Comp.	14,000	Dubbs	Op.
Astra Romana-Xenia, No. 32 Boulevard Regele Carol 1, Bucarest	Ploesti-Nord	E. Pfister	6,000	S	None	None	Op.
"Carmen Petrol" S.A. Romana Pentru Mine si Petrol, Boulevard I. C. Bratianu 22, Bucarest	Targoviste	Ing. Tscovici	4,500	S	None	None	Op.
Colombia Societie Franco-Rumanine de Petrol, 10 rue Romana, Bucarest	Ploesti	P. Bouvier	5,000	S-C	1,600	Dubbs	Op.
"Cometa" S.A.R. Pentru Industria si Comertul Petrolului, Bucarest	Ploesti	.....	2,000	S	None	None	Op.
Concordia Societie Anonyme Rumaine pour l'Industrie due Petrole, Strada Mate! Millo, No. 15, Bucarest	Ploesti-Nord	M. G. Baliff	30,000	S	None	None	Op.
Creditul Miniere S.A. Rumaine pour le Developpement, de l'Industrie Miniere, Boulevard Bratianu 16, Bucarest	Brazi-Prahova	T. Dodrescu	12,000	Comp.	3,500	Dubbs	Op.
Creditul Miniere S.A. Rumaine pour le Developpement, de l'Industrie Miniere, Boulevard Bratianu 16, Bucarest	Aurora-Baicoi	.....	6,500	S	None	None	Op.
Dacia Romano Petroleum Synd., Ltd., 83 Cannon St., E.C. 2, London, England; Cantacuzino 33, Bucarest	Ploesti	C. M. Leitch	6,500	S	None	None	Op.
Fratia	Ploesti-Sud	.....	3,200	S	None	None	Op.
I. Grigorescue S.A., Str. Poetul Alexandrescu No. 30, Targoviste	Targoviste	M. Istrati	1,500	S	None	None	Op.
Industriile de Petrol Orsova-Tileagd S.A., Strada Biserica Amzei 25, Bucarest	Orsova	.....	1,000	S	None	None	Op.
Noris	Ploesti-Sud	.....	1,350	S	None	None	Op.
"Petrol Block" Societe Anonima Romana, Strada Nicolae Golescu No. 7, Bucarest	Ploesti	M. Silberstein	12,000	S-C	3,450	Dubbs	Op.
"Petrol Block" Societe Anonima Romana, Strada Nicolae Golescu No. 7, Bucarest	Bucarest	Dr. Stevermann-Dr. Lobel	2,500	S	None	None	Op.
Petrol Latina, S.A. Romana, Strada Benito Mussolini 53, Bucarest	Plopeni-Prahova	.....	1,000	S	None	None	Op.
"Petrolmina" Societate, Romana de Mine si Petrol, Strada Gogu C. Cantacuzino 33, Bucarest	Ploesti	.....	3,000	S	None	None	Op.
"Petrolul Bucaresti" S.A. Romana (A.G.I.P., Italy), Boulevard Carol No. 64, Bucarest	Bucarest	.....	7,000	S-C	3,750	.....	Op.
"Photogen" Rafineria de Petrol, S.A. (Socony-Vacuum), Str. Juliu Maniu 104-108, Brasov	Brasov	.....	750	L-W-A	None	None	Op.
"Redeventza" S.A. Pentru Exploatarea si Comertul Produselor Subsolului, Rue Georges Clemenceau No. 2, Bucarest	Ploesti	M. Sain	3,500	S	None	None	Op.
'Romano-Americana S.A. (Standard of New Jersey), 126 Calea Victoriei, Bucarest	Teleajen	D. I. Maxwell	20,000	Comp.	8,000	Tube & Tank	Op.
"Romano-Belgiana Depetrol" S.A., Strada Biserica Amzei No. 28, Bucarest	Ramnicul-Sarat	.....	1,000	S	None	None	Op.
Spies Petroleum Co., Ltd., 17 Waterloo Place, S.W. 1, London, England	Ploesti	.....	5,000	S	None	None	Op.
Steaua Romana S.A. pour l'Industriedu Petrole, Boulevard Carol No. 17, Bucarest	Campina	.....	35,000	Comp.	8,000	Dubbs	Op.
Steaua Romana, Boulevard Carol No. 17, Bucarest	Moinesti	.....	2,000	S	None	None	Op.
Rafinaria de Petrol Titan, S.A.R., Boulevard Carol No. 30, Bucarest	Bucarest	.....	1,000	S	None	None	Op.
"Unirea" Societate Anonima Romanada Petrole (Phoenix Oil & Transport Co., Ltd.), Strada Gen. Berthelot No. 90, Bucarest	Ploesti (2 plants)	M. Wilson	*23,000	Comp.	3,500	.....	Op.
Rumanian Consolidated Oilfields, Ltd., 9-13 Fenchurch Bldg., Fenchurch St., London, England	Targoriste	.....	2,000	S	None	None	Op.
Total Rumania			238,300		45,800		

*One of the "Unirea" plants having 15,000 bbl. daily capacity was recently damaged or destroyed by fire.

SARAWAK
(British East Indies)

Sarawak Oilfields, Ltd. (Shell), Miri, Sarawak, Miri	Lutong	.....	20,000	S-L	None	None	Op.
Total British East Indies			10,000				

SPAIN

Compania Arrendataria del Monopolio de Petroles, 9 Torija, Madrid	Barcelona	.....	1,500	S-L	None	None	Op.
Total Spain			1,500				

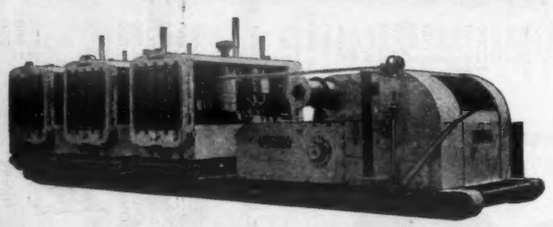
SUMATRA

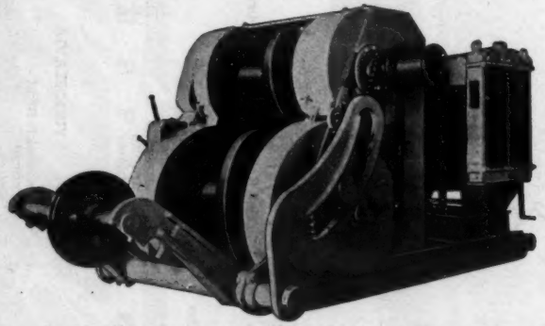
de Bataafsche Pet. Mij. (Shell), Carl van Bijlandtlaan 30, The Hague	Pangkalan Brandon	.....	18,000	S	None	None	Op.
de Bataafsche Pet. Mij. (Shell), Carl van Bijlandtlaan 30, The Hague	Pladjoe, Palembang	.....	45,000	S-C-L	2,500	Dubbs	Op.
Nederlandsche Kolonlale Pet. Mij., Gebouw Petrolea, P. O. Box 109, The Hague	Palembang	H. M. Davidson	45,000	Comp.	18,000	Tube & Tank	Op.
Total Netherland East Indies			160,000		28,500		

OIL

Drilling and Servicing Equipment

Another Model U10 in Action


Model U10 Three Engine Hook-Up.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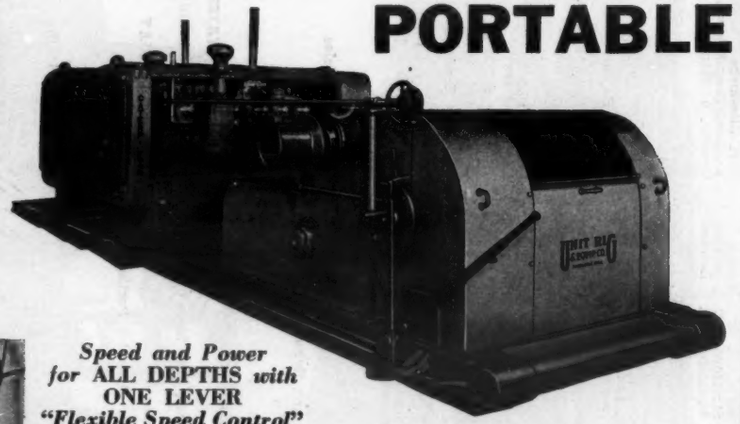

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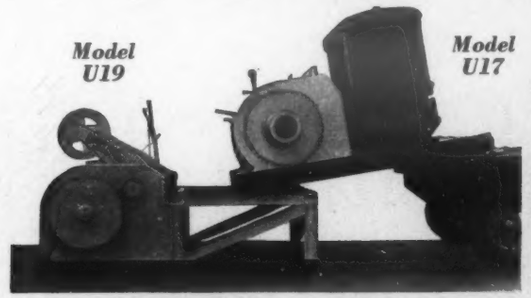
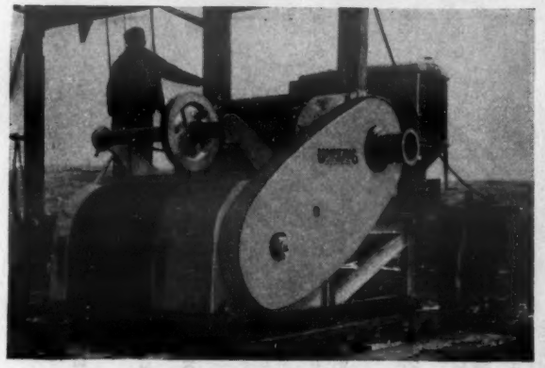
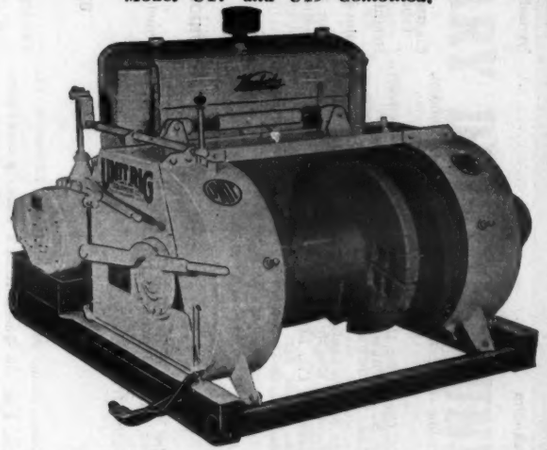
TULSA OKLAHOMA U.S.A.

Model U19

Model U17




Model U17 and U19 Combined.



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SWEDEN

Company and address—	Plant location	Superintendent	Crude capacity (bbl. dly.)	Type of refinery	Cracking equip. Capacity (bbl. dly.)	Cracking equip. Type	Operating status
A. Johnson & Co., Stockholm	Nynashamn		3,500	S-C	2,700	Dubbs	Op.
Total Sweden			3,500		2,700		

TRINIDAD

Trinidad Central Oilfields, Ltd., 16 Carrnon St., E.C. 4, London, England	Claxton Bay, Tabaquite	F. Middleton	500	S	None	None	Op.
Trinidad Lake Asphalt Operating Co., Ltd. (subsidiary of General Asphalt Co.), Barber, N. J., Philadelphia, Pa.	Brighton		1,000	A	None	None	Op.
Trinidad Leaseholds, Ltd., 1 London Wall Buildings, E.C. 2, London, England	Point-a-Pierre	F. L. Melvill	35,000	Comp.	18,350	Dubbs	Op.
United British Oilfields of Trinidad, Ltd., St. Helen's Court, Great St. Helen's, E.C. 2, London, England	Point Fortin		40,000	S-C	10,000		Op.
Trinidad Oil Fields Operating Co., Ltd., Port of Spain	La Brea		1,300		None	None	S.D.
Goldan & Co., Ltd., Mon Repos, San Fernando			500	S	None	None	S.D.
Kern Trinidad Oilfields, Ltd., 36-38 Kingsway, W.C. 2, London, England			1,000	S	None	None	Op.
Total Trinidad			79,300		28,350		

UNION OF SOUTH AFRICA

South African Torbanite Mining & Refining Co., Ltd., P. O. Box 7727, Anglovaal House, Fox Street, Johannesburg	Ermelo, Transvaal		1,000	S	None	None	Op.
Total Union of South Africa			1,000				

UNITED KINGDOM

England

A.G.W.I. Petroleum Corp., Ltd., Brettenham House, Lancaster Pl., London, E.C. 2	Fawley	H. D. Demoulins	12,000		7,000	Tube & Tank	Op.
Anglo-American Oil Co., Ltd., 36 Queen Anne's Gate, Westminster, S.W. 1, Westminster	Port Ellesmere		500		Specialty plant		Op.
Berry, Wiggins & Co., Ltd., Water Lane, Stratford, E.C. 2, London	Kingsnorth-on-Medway	W. W. Watt	2,500	S-L	None	None	Op.
Berry, Wiggins & Co., Ltd., Water Lane, Stratford, E.C. 2, London	Weaste, n. Manches'r	A. H. Hepworth	1,500	S	None	None	Op.
Cory Brothers & Co., Ltd., 57-59 St. Mary Axe, E.C. 3, London	Coryton	J. P. Johns	5,000	S-C	2,000	Cross	Op.
Herbert Green & Co., Ltd., Thames House, Millbank, S.W. 1, London	East Halton, Lincolnshire		1,500	S-L	None	None	Op.
Lobitos Oilfields, Ltd., 146 Dashwood House, Old Broad St., E.C. 2, London	Ellesmere Port	J. S. Parker	4,000	S	None	None	Op.
London and Thames Haven Oil Wharves, Ltd., 3 St. Helen's Place, E.C. 2, London	Thames Haven		18,000	S-L	None	None	Op.
Major & Co., Ltd., London	Hull		1,250		None	None	Op.
Medway Oil & Storage Co., Ltd., 76-88 Strand, W.C. 2, London	Isle of Grain, Kent		3,500	S-C	2,000	Cross	Op.
Shell Refineries, Ltd., St. Helen's Court, Great St. Helen's, E.C. 3, London	Shell Haven		15,000	S-L	None	None	Op.
London and Coastal Oil Wharves, Ltd., 85 Gracechurch St., E.C. 3, London	Canvey Island		1,500	S	None	None	Op.
Manchester Oil Refinery, Ltd., Twining Road, Barton, Manchester	Trafford Park	B. J. Varasour	2,000	S-L	None	None	Op.
Total England			68,250		11,000		

Scotland

Shell Refineries, Ltd., St. Helen's Court, Great St. Helen's, E.C. 3, London, England	Ardrossan, Ayrshire		5,000	Comp.	1,500		Op.
Scottish Oils, Ltd. (Anglo-Iranian), 53 Bothwell St., E.C. 2, Glasgow	Grangemouth	R. B. Southall	15,000	S-C-L	4,000	Cross	Op.
Scottish Oils, Ltd. (Anglo-Iranian), 53 Bothwell St., E.C. 2, Glasgow	Uphall		2,500	S-C-L	500	None	Op.
Total Scotland			22,500		6,000		

Wales

National Oil Refineries, Ltd. (Anglo-Iranian), Britannic House, Finsbury Circus, E.C. 2, London, England	Llandarcy	W. C. Mitchell	22,000	Comp.	3,500	Dubbs & Cross	Op.
Total Wales			22,000		3,500		
Total United Kingdom			132,750		20,500		

UNITED STATES

Complete report published in March 30, 1939 issue of The Oil and Gas Journal. The 1940 report will be published in the March 28, 1940 issue.

URUGUAY

Administracion Nacionale de Combustibles Alcohol y Portland, 25 de Mayo 409 (P. O. Box 869), Montevideo	Montevideo	H. Fratelli	5,000	Comp.	2,000	Dubbs	Op.
Total Uruguay			5,000		2,000		

U.S.S.R.

Glavneft (petroleum division), Moscow	Moscow		None	C	5,000	See footnote	Op.
Glavneft (petroleum division), Moscow	Saratov		None	C	35,000	See footnote	Op.
Glavneft (petroleum division), Moscow	Odessa		None	C	5,000	See footnote	Op.
Glavneft (petroleum division), Moscow	Kherson		None	C	5,000	See footnote	Op.
Glavneft (petroleum division), Moscow	Nijni-Novgoroc		3,500	S	None	None	Op.
Glavneft (petroleum division), Moscow	Yaroslavl		3,500	S-C	2,000	See footnote	Op.
Glavneft (petroleum division), Moscow	Orsk		12,000	S-C	4,000	See footnote	Op.
Glavneft (petroleum division), Moscow	Grozni		150,000	S-C	50,000	See footnote	Op.
Glavneft (petroleum division), Moscow	Taupse		35,000	S-C	7,000	See footnote	Op.
Glavneft (petroleum division), Moscow	Makhatch Kala		2,000	S	None	None	Op.
Glavneft (petroleum division), Moscow	Krasnodar		25,000	S	None	None	Op.
Glavneft (petroleum division), Moscow	Khabarovsk		4,500	S-C	3,500	See footnote	Op.
Glavneft (petroleum division), Moscow	Baku-Batum		375,000	S-C	50,000	See footnote	Op.
Glavneft (petroleum division), Moscow	Ufa		12,000	S-C	4,000	See footnote	Op.
Glavneft (petroleum division), Moscow	Ishimbevo		10,000	S	None	None	Op.
Glavneft (petroleum division), Moscow	Neftedag		4,000	S-C	3,000	See footnote	Op.
Glavneft (petroleum division), Moscow	Berdiansk		None	C	5,000	See footnote	Op.
Glavneft (petroleum division), Moscow	Georgia		500	S	None	None	Op.
Glavneft (petroleum division), Moscow	Garodki		500	S	None	None	Op.
Total U.S.S.R.			637,500		178,500		

Footnote: Most cracking plants in the U.S.S.R. are of the Winkler-Koch, Gyro, and vis-breaker types modified in most cases after designs of Soviet engineers.

VENEZUELA

Caribbean Petroleum Co. (Shell), Apartado 19, Maracaibo	San Lorenzo		16,000	S	None	None	Op.
Colon Development Co., Ltd., Apartado 19, Maracaibo	Tarra field		600	S	None	None	Op.
Compania de Petroleo Lago, Apartado 849-869, Caracas	Cabimas	D. E. Johnson	8,000	S	None	None	Op.
Compania de Petroleo Lago, Apartado 849-869, Caracas	Maracaibo	D. E. Johnson	2,000	S	None	None	S.D.
Standard Oil Co. of Venezuela, Apartado 889, Caracas	Carapito	P. J. Kelly	26,800	S-C	22,800	Vis-breaker	Op.
Mene Grande Oil Co., Apartado 234, Maracaibo	Cabimas	S. H. Oter	1,500	S	None	None	Op.
Total Venezuela			54,900		22,800		

YUGOSLAVIA

Standard-Vacuum Oil Co. of Jugoslavia, Inc., Brod	Bosanski Brod		2,250	L-WA	None	None	Op.
Shell Oil Co. of Jugoslavia, Ltd., Gajeva ul. 5, Zagreb	Caprag		2,000	S	None	None	Op.
Ivanovic & Co., Osijek	Osijek	Ing. L. Ravici	550	S	None	None	Op.
Total Yugoslavia			4,800				

"Oilwell" ROTARY DRILLING UNIT

THE "Oilwell" Rotary Drilling Unit consists of an efficient, twin-cylinder, vertical steam engine direct-connected through a two-speed gear box to a high-speed, oilbath rotary. The entire unit is compactly assembled on a portable, steel-skid base. Some of its advantages are shown at the right.

- ★ *Eliminates wear and replacement of rotary chain and sprockets.*
- ★ *Reduces wear-and-tear on the rotary, hoist and hoisting engine.*
- ★ *Provides an auxiliary prime mover for emergency hoisting.*
- ★ *Saves time in breaking-out drill pipe.*
- ★ *Reduces the danger of twisting-off.*
- ★ *Reduces noise and increases safety.*
- ★ *Is light and portable and is easily installed.*

SPECIFICATIONS

Size	No. 9272	No. 72715 No. 7272	No. 71715
Engine (Vertical, Twin-cylinder)	10" x 9"	7¾" x 7"	7¾" x 7"
Rotary (High-speed, Oilbath)	27½"	27½"	17"
Speed Ratios of Gear Box.....	1:1 and 1:2 1:1 and 1:2.6 1:1 and 1:3.6	1:1 and 1:1.54 1:1 and 1:2	1:1 and 1:1.54
Weight, complete	28,825 lbs.	22,800 lbs.	17,645 lbs.

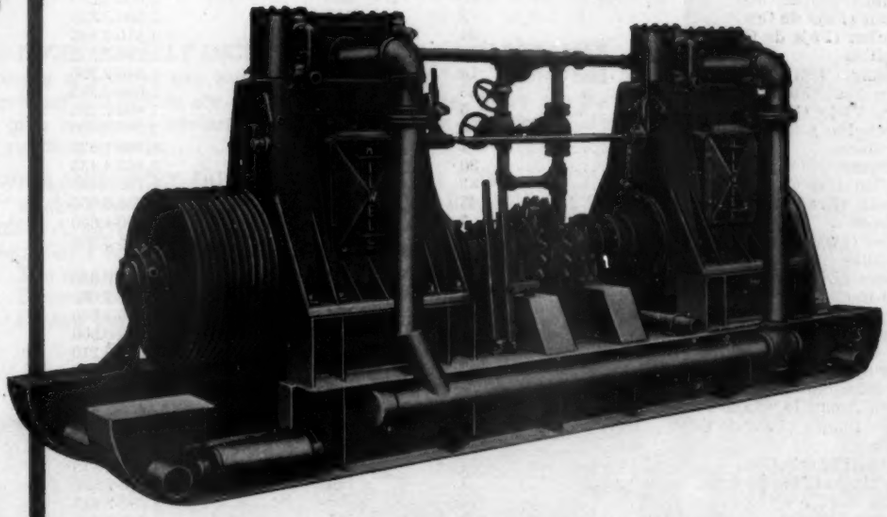
"Oilwell" PORTABLE DOUBLE ENGINE DRIVE

THE "Oilwell" Portable Double Engine Drive is a compact assembly including two vertical steam engines with complete steam and exhaust manifolding, power take-offs, and the control levers and valves needed for operating the engines either individually or in tandem. Its unitized construction facilitates moving and installation. Its applications are:

- ★ *Hoisting with one engine or with both.*
- ★ *Driving a power pump with one engine while driving the rotary through the hoist with the other engine.*
- ★ *Using each engine for an individual pump drive when the rig is equipped with an "Oilwell" Rotary Drilling Unit.*

SPECIFICATIONS

Size	No. 7	No. 9
Engines (Two, Twin-cylinder, Vertical) ...	7¾" x 7"	10" x 9"
H. P. at 400 r.p.m. (Two Engines, 83% cut-off):		
325 lbs./sq. in. steam pressure at the throttle	720	1420
225 lbs./sq. in. steam pressure at the throttle	500	995
Weight of Each Engine ..	6,250 lbs.	11,180 lbs.
Weight of Complete Drive.	25,700 lbs.	42,300 lbs.



• *Send for Complete Information.*

"Oilwell"

OIL WELL SUPPLY COMPANY

SURVEY OF WORLD OIL FIELDS

(Continued from Page 77)

IRAN

Name of field and location—	Producing wells	Daily av. prod. (bbl.)	Wells drilling	Producing depths	Gravity A.P.I.	Base of crude	Outlet*	Age of field (years)
Masjid-Sulaiman	†30	73,425	1	2,500-3,500	37.6	Paraffin	P.L.-Ref.	28
Haft Kel	‡25	143,288	2	4,500-5,000	37.6	Paraffin	P.L.-Ref.	10
White Oil Springs*	3	shut in	1	.....	...	Paraffin	....	5
Gach Saran*	5	shut in	2	4,500-6,000	...	Paraffin	....	3
Naft-i-Shah	10	1,800	1	.....	...	Paraffin	Ref.	12
Lali*	0	.....	1	.....	...	Paraffin	....	..
Agha Jari*	2§	.....	1	5,500-8,810	...	Paraffin	....	..
Pazanun*	0	.....	1	.....	...	Paraffin	....	..
Chia Surkh*	0	.....	1					
Total Iran	75	218,513	11					

*Fields thus identified are in various stages of exploration. †There are in addition about 40 input and observation wells. ‡There are in addition about 15 input and observation wells. §Gas wells. Most of Iran's output is produced by the Anglo-Iranian Oil Co., Ltd., under a concession from the Government of Iran. A large part of the crude is refined at the company's plant located at Abadan, Iran, one of the industry's largest and most complete refineries.

IRAQ

Kirkuk	42	85,152	2	2,100-2,200	36	M.	P.L.†	12
Qaiyarah-Najmah:								
Jawan-Qasab—								
Lower Fars zone	3			650	18.2	M.	....	4
Limestone zone	42	*100	..	690	15.8	..	....	12
Pilsner zone	8			1,500	17.0	M.	....	5
Naft Khaneh	7	400	1					
Total Iraq	102	85,552	‡9					

*This production is exclusively devoted to fuel and road-oil requirements, some of which is delivered to the government, and credited to rental and royalty payments. †All crude produced by Iraq Petroleum Co., Ltd., and delivered by its pipe-line system to Mediterranean terminals located at Haifa, Palestine, and Tripoli, Syria. ‡Six rigs of this total are engaged in wildcat exploration at various points in British Oilfield Development concessions.

KUWAIT (Persian Gulf)

Burgan	3	Shut in	1	3,500-4,500	34	M.	....	2

'Operations carried on by Kuwait Oil Co., Ltd., (Gulf Oil Corp. and Anglo-Iranian Oil Co., Ltd.).

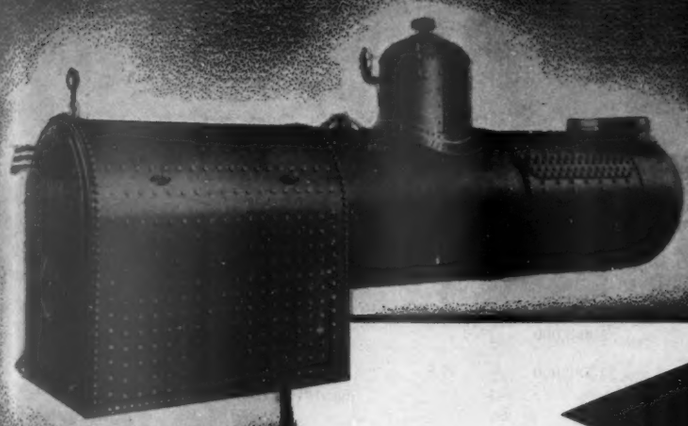
MEXICO

San Luis Potosi:								
El Limon	4	180	..	1,855-2,750	11.6	A.	P.L.	17
Ebano	32	1,758	..	1,465-2,725	11.6	A.	P.L.	35
Tamaulipas:								
Altamira	14	183	5	1,420-2,610	15.7	A.	P.L.	13
Vera Cruz:								
Agua Dulce (Tonala)	74	4,209	..	1,860-3,280	28.7	P.	P.L.	11
Acalapa	4	3	..	2,200-2,520	29.8	P.	P.L.	4
Alamo (Faja de Oro)	10	333	..	2,095-2,295	24.0	A.-P.	P.L.	26
Alazan (Faja de Oro)	2	110	..	2,000-2,320	22.1	A.-P.	P.L.	27
Amatlan (Faja de Oro)	44	1,826	..	1,810-2,455	20.4-21.4	A.-P.	P.L.	26
Cacalilao	108	3,470	..	1,250-2,575	12.3-12.7	A.-P.	P.L.	17
Chinampa (Faja de Oro)	14	443	..	1,540-2,290	20.5-21.4	A.-P.	P.L.	30
Cerro Azul (Faja de Oro)	23	5,177	..	1,680-2,885	20.9	A.-P.	P.L.	23
Cerro Viejo (Faja de Oro)	5	45	..	1,890-2,295	22.8	A.-P.	P.L.	18
Chiconcillo y San Miguel	5	17	1	2,140-2,600	20.4-21.4	A.-P.	P.L.	16
Dos Bocas	1	90	..	1,760-1,825	18.8	A.-P.	P.L.	30
El Burro	30	2,219	..	2,445-4,455	27.3	P.	P.L.	8
El Plan (las Choapas)	31	9,176	4	1,790-5,745	22.5	P.	P.L.	8
Filisola (Francita)	43	869	..	2,775-3,555	21.5	P.	Tankers	16
Furbero	1	4	..	1,900-4,640	25.7	A.-P.	P.L.	33
Jardin (Faja de Oro)	4	63	..	2,115-2,305	24.0	A.-P.	P.L.	17
Moralillo	1	88	..	3,850	20.9	A.-P.	P.L.	6
Panuco (Diversos)	149	4,174	5	1,312-2,955	11.7-19.7	A.	P.L.-Tankers	26
Paso Real (Faja de Oro)	11	372	..	2,245-2,660	32.6	A.-P.	P.L.	14
Potrero del Llano (Faja de Oro)	5	104	..	1,815-1,940	21.8	A.-P.	P.L.	29
Poza Rica	82	74,810	4	6,715-8,500	24.5-34.7	A.-P.	P.L.	9
San Sebastian	1	30	..	2,600-3,210	13.1	A.	Tankers	10
Tanguijo	2	1	..	450-3,220	22.0	A.-P.	Tankers	28
Tepetate (San Jose)	4	65	..	1,980-2,400	20.7-21.1	A.-P.	P.L.	24
Tierra Amarilla (Faja de Oro)	8	66	..	2,435-2,480	22.7	A.-P.	P.L.	28
Tierra Blanca (Faja de Oro)	3	13	..	1,970-2,310	20.9	A.-P.	P.L.	18
Topila	30	857	..	595-3,365	11.5-15.6	A.	P.L.-Tanker	28
Toteco (Faja de Oro)	10	554	..	1,785-2,419	19.9	A.-P.	P.L.	18
Zacamixtle (Faja de Oro)	3	136	..	2,190-2,520	20.5-21.2	A.-P.	P.L.	19
Ebano	73	5,756	1	1,280-2,615	11.6	A.	P.L.	35
Limon	5	161	..	1,765-2,605	11.6	A.	P.L.	17
Total Mexico	786	117,362	20					

Most of the private oil properties in Mexico were expropriated by government March 18, 1938. Properties are now operated under the name of Petroleos Mexicanos with government management.

Mexico's Gas Fields

Tamaulipas:					
La Presa	2	255,207	1,535-2,025	Pipe line	8
Rancherias	6	9,918,269	1,270-6,265	Pipe line	6
Mier	4	5,398,565	1,225-2,035	Pipe line	5
Vera Cruz:					
Poza Rica	15	65,677,826	6,715-8,500	Pipe line	9
Tonala	74	2,347,713	1,865-3,280	Pipe line	11
El Burro	31	1,505,249	2,445-4,455	Pipe line	8
El Plan	26	6,560,954	1,790-5,745	Pipe line	8
Filisola	43	318,281	2,770-3,555	Pipe line	16
Cerro Azul-Toteco	33	.....	1,680-2,885	Pipe line	23



LUCEY WELDED FIRE BOX OIL COUNTRY BOILERS
86, 104 and 125 H.P.—250 and 300 lb. W.P.

Lucey Boilers are built in accordance with A.S.M.E. Code; meet all A.P.I. Specifications and are stamped with A.P.I. monogram. They have full size, Welded Fire Box with no rivets to overheat or burn. No Leaky Seams. Short tubes in vertical rows. Effective heating surface. Ample space between Crown Sheet and Outside Wrapper.

LUCEY HI-TENSILE STRENGTH OIL COUNTRY BOILERS
125 H.P. and 150 H.P.—300 and 350 lb. W.P.

These Boilers are built from high tensile plates to secure maximum strength with minimum weight. They have Lucey Welded Fire Box, 60" wide, 72½" high and 96" long. No dome is necessary—but may be supplied—since space above curved crown sheet of fire box is 20", providing ample steam liberating space with two gauges of water.

WHELAND-LUCEY OIL BATH SWIVEL E-6500-BA

Designed for deepest wells. A heavy duty Timken Tapered Roller Bearing carries main load. End thrust is taken by an SKF Ball Bearing located above the main load bearing. Two American Roller Bearings located below the main load bearing take radial thrust and insure alignment of stem.

"PITTSBURGH SPECIAL DOUBLE GRIP" ROTARY DRILL PIPE

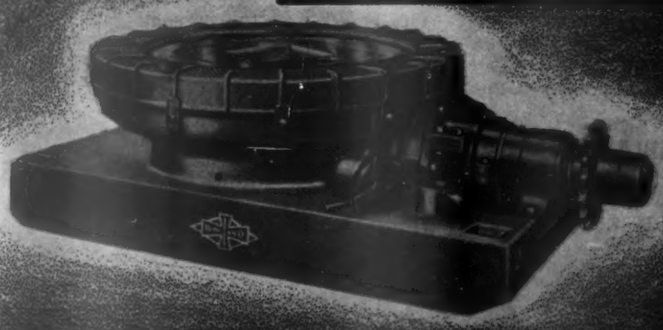
This type of Drill Pipe has all the advantages of shoulder-welding without any of the disadvantages. The tight-fitting shoulder and the 35% or more added contact surface relieve the last engaged threads on the pipe of destructive vibrations, whipping and "biting" and seal the joint. Available in either Internal Upset or External Upset-Internal Flush.

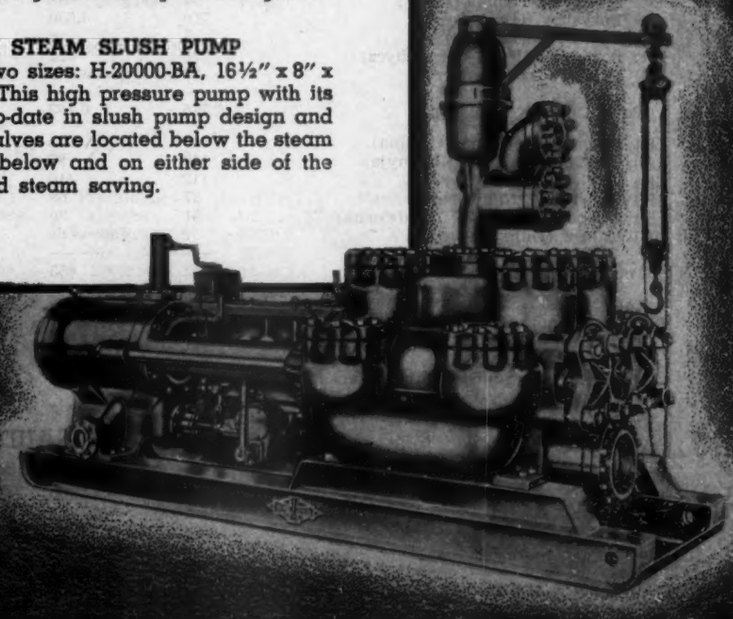
WHELAND-LUCEY TOTALLY ENCLOSED TRIPLE OIL BATH ROTARIES

These rotary machines are built in three sizes: 17½", 20½" and 27½", providing a machine for any size or depth hole. They are designed to give increased performance, greater safety and longer life at higher rotating speeds.

WHELAND-LUCEY DUPLEX STEAM SLUSH PUMP

This 20" stroke Pump is built in two sizes: H-20000-BA, 16½" x 8" x 20"; H-20000-AA, 15½" x 8" x 20". This high pressure pump with its self-draining steam end is most up-to-date in slush pump design and efficiency. The steam and exhaust valves are located below the steam cylinders. Exhaust connections are below and on either side of the cylinders. Fifteen per cent estimated steam saving.





Domestic Distributor — Lucey Products Corporation, Tulsa, Oklahoma.

LUCEY EXPORT CORPORATION

OIL WELL SUPPLIES

3505 Woolworth Building, New York, N. Y.

Broad Street House, E. C. 2, London, England.
Calle Defensa 320, Buenos Aires, Argentina.

58 High St., San Fernando, Trinidad, B. W. I.
Str. Vasile Lupu No. 13, Ploesti, Roumania.

NETHERLAND EAST INDIES

Name of field and location—	Producing wells	Daily av. prod. (bbl.)	Wells drilling	Producing depths	Gravity A.P.I.	Base of crude	Outlet*	Age of field (years)
British Borneo:								
Sarawak and Brunei	457	17,450	3	130-5,790	32	M.	Refinery	30
East Borneo:								
Balikpapan and Tarakan	856	33,700	8	210-3,280	18	A.	Refinery	44
Ceram	51	2,070	2	240-1,020	..	M.	Refinery	43
Java	340	16,850	5	130-3,000	..	M.	Refinery	52
South Sumatra:								
Palembang-Djambi	1,338	90,300	33	†130-2,950	37.8	P.	Refinery	43
North Sumatra	167	21,850	6	.....	..	M.	Refinery	54
Total East Indies	3,209	180,220	57					

*A network of pipe lines moves East Indies crude to refining centers on the islands and most of the products are exported to the Far East, Near East, African and European countries. Subsidiaries of the Standard Oil Co. of New Jersey and Royal Dutch-Shell are the principal operating companies.
†Wells in this area have been drilled as deep as 6,300 ft. but production from that depth at present could not be confirmed.

PERU

La Brea-Parinas, Piura	1,974	27,906	23	1,000-3,500	38	M.	Local and export	50
Lobitos and Restin, Piura	742	7,210	4	150-6,500	...	M.	Local and export	35
Zorritos, Tumbes	47	163	3	600-3,000	...	M.	Local and export	56
Pachitea	2	Shut in	..	1,050-1,150	46.4	P.	None	1
Pirin, Dept. of Puno	2	75	2	800	35	M.	Local	21
Total Peru	2,767	35,354	32					

*International Petroleum Co., Ltd., largest producer, refines part of its production at Talara, Peru, and moves the remainder by tanker. Lobitos Oilfields, Ltd., has practically all the remaining marketed crude which is transported by tanker to points outside Peru.

POLAND (Now German and Russian)

(G) Lipinki-Libusza (Gorlice)	676	1,120	..	150-2,700	34	Paraffin	P.L.	74
(G) Biecz-Korczyna (Gorlice)	48	72	..	480-1,440	39	Asphalt	P.L.	42
(G) Sekowa-Siary (Gorlice)	114	40	..	450-1,350	35	Asphalt	P.L.	67
(G) Ropianka (Krosno)	15	4	..	380-1,120	31	Asphalt	P.L.	71
(G) Harklowa (Jaslo)	145	145	..	1,065	27	Asphalt	P.L.	69
(G) Roztoki-Sadkowa (Jaslo)	22	37	..	3,000-3,900	40	Asphalt	P.L.	30
(G) Mencinka-Jaszczew	34	124	..	2,400-3,600	42	Paraffin	P.L.	30
(G) Potok-Toroszowka (Krosno)	105	368	..	416-1,120	42	Asphalt	P.L.	48
(G) Krosno-Kroscienko (Krosno)	68	45	..	900-2,000	32	Mixed	P.L.	51
(G) Klimkowka (Krosno)	33	10	..	360-1,120	35	Asphalt	P.L.	49
(G) Bobcka-Rogi (Krosno)	96	131	..	480-3,200	34	Mixed	P.L.	81
(G) Lubatowka-Wulka	80	80	..	690-2,120	29	Asphalt	P.L.	51
(G) Strachoeina-Gorki (Sanok)	3	1.5	..	2,940-3,000	40	Asphalt	P.L.	11
(G) Zmiennica-Turzepole (Brzozow)	43	68	..	1,480-2,400	33	Paraffin	P.L.	43
(G) Humniska, etc. (Krosno)	61	210	..	2,300-2,940	47	Mixed	P.L.	43
(G) Weglowka (Krosno)	86	62	..	270-1,050	29	Asphalt	P.L.	52
(G) Tyrawa Solna (Sanok)	50	85	..	300-900	44	Asphalt	P.L.	27
Total Jaslo District	1,679	2,502						
(R) Lipic-Czarna (Lesko)	36	103	..	1,020-1,310	42	Mixed	P.L.	53
(R) Wankowa-Paszowa (Lesko)	382	460	..	1,150-1,900	34	Paraffin	P.L.	53
(R) Strzelbice (Sambor)	37	40	..	660-4,270	32	Paraffin	P.L.	58
(R) Boryslaw (Drohobycz)	710	4,650	..	4,270-5,700	33	Paraffin	P.L.	45
(R) Opaka (Drohobycz)	5	8	..	1,970-80	43	Paraffin	P.L.	43
(R) Schodnica-Urycz (Drohobycz)	576	922	..	1,480	36	Mixed	P.L.	79
(R) Daszawa (Drohobycz)	29	gas wells	..	2,300	..	...	...	18
Total Drohobycz District	1,775	6,183						
(R) Raypne-Perehinsko (Dolina)	140	254	..	2,625	36	Paraffin	P.L.	52
(R) Majdan-Kosmacz (Kolomyja)	110	87	..	1,150-1,920	30	Asphalt	P.L.	50
(R) Bitkow (Nadworna)	112	410	..	3,610	44	Paraffin	P.L.	40
(R) Pasieczna (Nadworna)	37	68	..	660-4,700	45	Mixed	P.L.	59
(R) Sloboda-Rungurska (Nadworna)	51	36	..	185-2,400	36	Paraffin	P.L.	64
(R) Kalusz (Kalusz)	2	gas wells	..	2,600	..	...	...	4
Total Stanislawow District	452	855						
Total Poland	3,906	9,540						
Total German	1,679	2,502						
Total Russian	2,227	7,038						

Note: Fields preceded by (G) are now in German territory. Fields preceded by (R) are now in Russian territory.

SAUDI ARABIA

Dammam	8	18,000	5	4,500	35.5	A.	(†)	2
Dammam	3	160	..	2,100	50	A.	(†)	4
Dammam	1 gas	.....	..	2,100	...	..	....	..
Abu Hadrya	...	.....	1	.....	...	..	....	..
Ma'agala	...	.....	1	.....	...	..	....	..
*Total Saudi Arabia	12	18,160	7					

*Produced and marketed by California Arabian Standard Oil Co. (Standard of California). †Pipe line to Ras Tanura, Saudi Arabia, sea terminal.

U.S.S.R.

Up-to-date and complete information on operations not available. Special article in this issue discusses operating conditions.

RUMANIA

Name of field and location—	Producing wells	Daily av. prod. (bbl.)	Wells drilling	Producing depths	Gravity A.P.I.	Base of crude	Outlet	Age of field (years)
Moreni, Prahova District	278	14,358	3	1,000-5,600	33	M.	P.L.	36
Piscuri, Prahova	115	6,762	2	1,200-4,000	33	M.	P.L.	12
Margineni, Prahova	10	1,122	3	6,100-7,500	39	P.	P.L.	4
Aricesti, Prahova	12	587	1	5,500,7,400	35	P.	P.L.	18
Tintea, Prahova	95	24,253	18	600-8,800	39	M.	P.L.	78
Baicoi, Prahova	46	1,387	3	600-8,800	39	M.	P.L.	78
Lilesti, Prahova	7	859	3	600-8,800	39	M.	P.L.	78
Malaesti, Prahova	...	...	..	.....	..	..	....	..
Boldesti, Prahova	89	12,676	2	6,900-7,900	37	P.	P.L.	17
Ceptura, Prahova	131	15,560	1	2,400-4,100	34	P.	P.L.	26
Chitorani, Prahova	...	...	..	.....	..	..	....	..
Runcu Bustenari, Prahova	138	1,902	3	100-2,500	42	P.	P.L.	95
Chiciura-Bustenari-Bordeni, Prahova	424	2,500	7	100-2,500	42	P.	P.L.	95
Campina	68	574	2	700-1,200	41	P.	P.L.	55
Gura Draganesei-Pitigaia	3	60	..	1,100-4,200	38	P.	P.L.	59
Copaceni	8	262	..	700-2,200	41	P.	P.L.	35
Scaiosi	4	26	..	1,450-1,800	40	P.	P.L.	10
Magurele	...	...	..	.....	..	..	...	..
Surani	...	...	..	.....	..	..	...	..
Total Prahova	1,428	82,888	48					
Gura-Ocnitei, Dambovita	323	25,639	5	5,400-5,900	33	P.	P.L.	10
Rasvad, Dambovita	37	5,040	1	600-1,400	38	P.	P.L.	83
Bucsani, Dambovita	85	6,320	..	6,500-7,300	38	P.	P.L.	6
Ochiuri, Dambovita	91	5,133	1	1,300-4,000	33	M	P.L.	26
Teis-Aninoasa, Dambovita	13	945	1	500-1,000	37	P.	P.L.	..
Viforata, Dambovita	11	463	1	600-1,900	38	P.	P.L.	..
Glodeni, Dambovita	6	20	..	1,000-2,000	39	P.	P.L.	42
Doicesti, Dambovita	1	...	..	1,700-1,900	39	P.	P.L.	27
Capsuna, Dambovita	work over	...	1	.....	..	..	...	..
Total Dambovita	567	43,560	10					
Arbanasi, Buzau	94	823	2	200-1,000	38	P.	P.L.	70
Solont, Stanesti, Zemes, Taslau, Moinesti, Lucacesti, Comanesti, Grozesti, Tetcani, Casin Bacau District	172	925	1	200-2,200	43	P.	P.L.	67
Total Bacau District	266	1,748	3					
Total Rumania	2,261	128,196	61					

TRINIDAD

Name of field and location---	Producing wells*	Daily av. prod. (bbl.)	Wells drilling	Producing depths	Gravity A.P.I.	Base of crude	Outlet†	Age of field (years)
Lot One	..	6,908	3	1,688-4,419	....	..	....	29
Point Fortin	..	6,309	5	90-5,602	18-27	A.	....	32
Guapo Pool	..	880	..	.....	..	..	....	..
Vessigny	..	633	1	.....	....	..	....	..
Brighton	..	53	..	100-3,622	13-25	A.	....	32
Tabaquite	..	29	..	300- 500	42	P.	....	20
Lizard Springs	..	3	..	.....	....	..	....	..
Palo Seco	..	5,636	3	100-5,373	21-43	A.	....	30
Coora	..	3,226	2	.....	....	..	....	..
Point Liqoure	..	27	..	.....	....	..	....	..
Fyzabad-San Francique	..	26,862	1	100-5,402	15-40	A.	....	26
Penal	..	1,535	1	650-4,656	....	..	....	..
Guayaguayare	..	194	2	580-4,600	....	..	....	38
Barrackpore	..	484	..	500-2,000	17-38	A.	....	29
Cedros	...	.....	1	.....	....	..	....	30
Total Trinidad	..	52,779	19					

*Figures not available. †Short pipe lines and refineries.

VENEZUELA

Name of field and location—	Producing wells	Daily av. prod. (bbl.)	Wells drilling	Producing depths	Gravity A.P.I.	Base of crude	Outlet*	Age of field (years)
Ambrosio, Maracaibo	79	2,600	..	800-2,800	12-30.2	A	Tankers	23
La Rosa, Maracaibo	618	43,000	..	800-2,800	12-30.2	A	Tankers	23
Benitez, Maracaibo	89	21,000	2	800-2,800	12-30.2	A	Tankers	23
Tia Juana, Maracaibo	419	136,000	..	1,900-3,100	10-28.5	A	Tankers	12
Lagunillas, Maracaibo	961	205,000	8	2,270-4,900	10.5-27	A	Tankers	14
Bachaquero, Maracaibo	19	9,600	..	3,150-5,160	13-17.3	A	Tankers	10
La Paz and Concepcion, State of Zulia	83	3,900	1	950-3,800	14.5-40	P-A	P.L.-Tankers	15
Tarra and Los Manueles	66	15,300	2	800-4,500	24-35	M	P.L.-Tankers	10
Mene Grande, Zulia	196	35,000	5	450-5,000	14.5-30 41-50	A	P.L.-Tankers	26
El Mene and Media, Falcon	72	1,100	..	750-3,000	33-34	P	P.L.-Tankers	13
Cumarebo, Falcon	57	7,300	..	650-1,500	48.8-50.6	P	P.L.-Tankers	9
Quiriquire, Monagas	211	73,000	..	2,600-3,100	18.4-19	A	P.L.-Tankers	10
Pedernales, Amacuro	9	5,200	..	5,000-6,000	21-21.2	A	P.L.-Tankers	4
Temblador, Monagas	54	10,000	2	3,500-4,000	21.4-23.1	A	P.L.-Tankers	3
Oficina, Anzoategui	27	4,200	4	3,900-6,300	16-44	M	P.L.-Tankers	3
Jusepin, Monagas	7	1,300	2	4,150-5,150	31.5-32.6	M	P.L.-Tankers	1
Others	12	1,500	7	.....	.....	..	.....	..
Total Venezuela	2,979	575,000	33	.....	.....	..	.....	..

*The principal producing companies in Venezuela are subsidiaries of the Royal Dutch-Shell (Venezuela Oil Concessions, Caribbean Petroleum Co., and Colon Development Co., Ltd.) and the Standard Oil Co. of New Jersey (Creole Petroleum Corp. through Standard Oil Co. of Venezuela and Lago Petroleum Corp.). Most of the Standard of New Jersey production is refined at a large plant of a subsidiary unit—Lago Oil & Transport Co., Ltd.—located on Aruba Island, N. W. I., and that of the Shell units at the large refinery of C. P. I. M. (Shell) located on the island of Curacao, N. W. I. The third largest producing company in Venezuela is the Mene Grande Oil Co. (Gulf Oil Corp.) and its output is marketed by that company. The British Controlled Oilfields, Ltd., is the fourth largest producing company and markets its own output. The four principal producing units have refineries located in Venezuela.

Complete Two Wells at 500 Ft. in Netherland New Guinea

PRELIMINARY exploratory drilling has proved the existence of oil production in Netherland New Guinea.

Two shallow wells were successfully completed at approximately 500 ft. in New Guinea this year. Each was capable of yielding approximately 2,000 bbl. per day of 20° gravity crude oil. In addition, two deep tests are in progress, and one, now drilling at around 5,000 ft., passed up a showing of oil which gave strong indications of commercial potentialities around 3,200 ft.

Exploration in Netherland New Guinea is carried on by N. V. Nederlandsche Nieuw Guinea Petroleum Maatschappij, Batavia, in which British, Netherlands, and American companies are interested. Exploration work during the past four years in Netherland New Guinea has resulted in release of a part of the original concession.

At the end of 1937, a total of 1,507,000 acres was returned to the government, and 1,738,804 acres were placed at the disposal of the government on December 28, 1938, the total concession has been reduced to 24,154,196 acres. Aerial survey and mapping operations are now almost complete, 16,241 photographs have been taken and of these, 15.491 have been elaborated geologically. Various methods of geological and geophysical investigation have been applied, such as core drilling, regional gravitation and gravimetric and seismographic investigation. These latter methods were employed where marshy conditions did not permit of surface investigation. Two deep-drilling operations are under way in the Vogelkop, one at Sele and the other at Wasian. At Wasian, drilling is proceeding below 5,000 ft., while at Sele drilling continues below 4,500 ft. Preparations have been made to start a third deep test at Karabra.

The staff consists of 147 Europeans and Americans, and 3,700 Asiatics. Attempts to carry on operations with local labor have not been very successful, owing to the primitive character of the Papuan natives. Besides 22 motorboats, there are four house boats for the European and American employes, while the fleet of vessels employed now totals 6, including one tanker of 195 tons. Semipermanent buildings have been erected at places in the exploration area, as at Babo and Kasim. In December last year one of the company's two American-made amphibian planes was wrecked in a crash, and as the other will shortly be put out of commission, two Grumman flying boats were ordered. They arrived at Babo in October. Pending the arrival of these planes, an amphibian was temporarily leased from the Bataafache Petroleum Maatschappij (Royal Dutch Shell), Batavia, usually called B.P.M.

Efforts of Nederlandsche Kolonial Petroleum, Mij., subsidiary of Standard-Vacuum Oil Co., to find oil in its Kahajan concession in South Borneo have not met with success and the company has decided to abandon the concession. Investigations in a territory north of this concession have also proved futile, so the whole of this area in South Borneo is now regarded as less attractive.

N.K.P.M. is meanwhile actively engaged in investigation in other parts of the archipelago, including northeast Borneo. Deep drilling by B.P.M. in its search for oil sources near Lho Soekon, in Atcheen Province, North Sumatra, has exceeded a depth of 10,460 ft., which is a record. No oil has been struck.

Total production of crude in the Netherland Indies during the first seven months of 1939 showed an increase of 8 per cent compared with the preceding year, and of this increase about two-thirds is for the account of the Palembang fields and one-third for that of Djambi, according to official statistics. In Java and Madura, production declined by about 20 per cent compared with the corresponding period of 1938.

An amendment has been submitted in the Volksraad (People's Council) by certain members (including two native members) for the inclusion of an item called "Further Temporary Special Payment by Petroleum Companies" in the 1940 draft budget, the object being to obtain a contribution of at least $2,650,000 to the exchequer for the year 1940 from petroleum companies operating in the Netherland Indies, pending the introduction of legislation which would lead to higher revenue from the exploitation of the petroleum resources of this country.

Robert Yarnall Richie Photo

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New Refinery Engineering Booklet Being Distributed

The Lummus Co., for over 40 years engaged in the design and assembling of refining equipment, has just issued an unusually attractive and informative booklet containing 100 large pictures of its important refinery installations in the United States and abroad. The booklet has stiff covers and illustrates the engineering facilities of the company, as well as showing the actual plant installations. All illustrations are explained in six languages.

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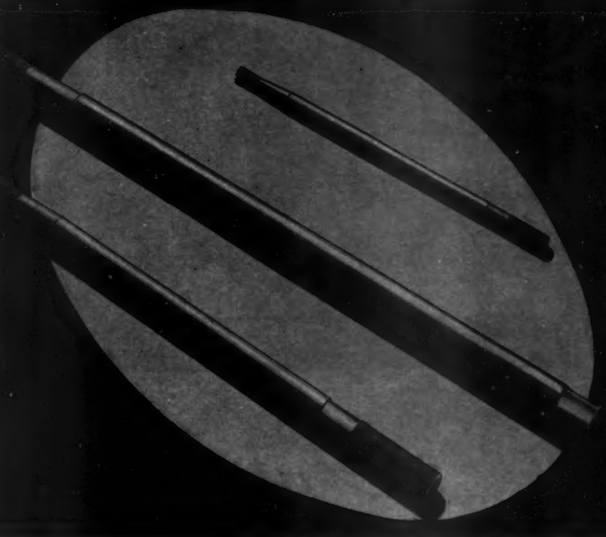

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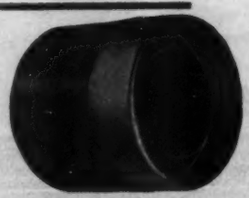

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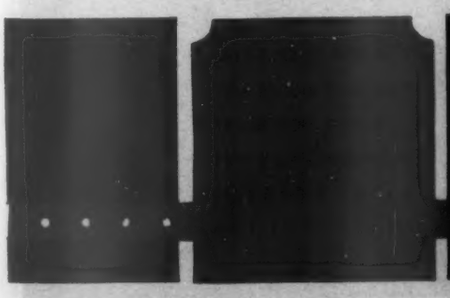

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Introducing the

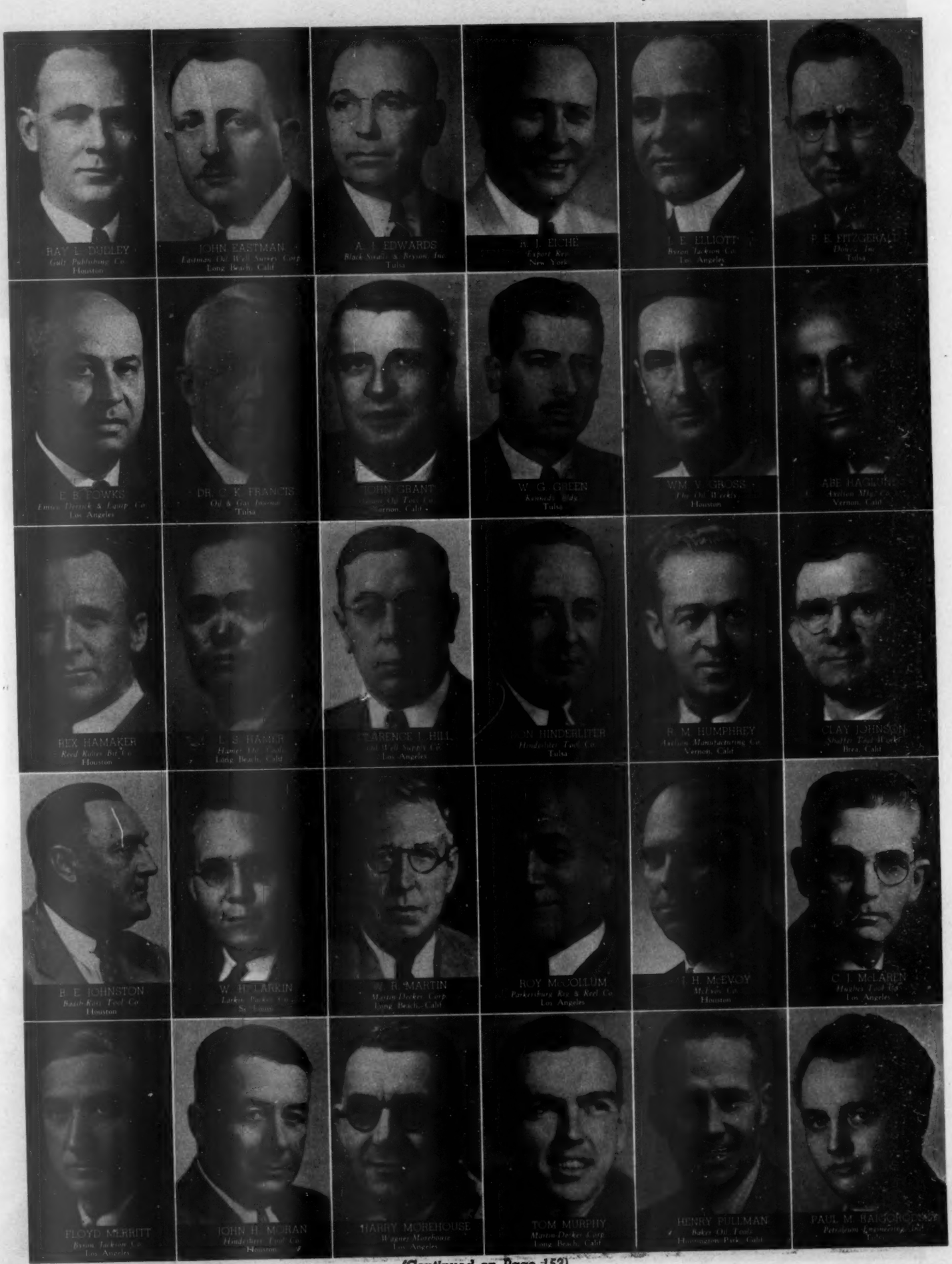
NOMADS

A YEAR ago a group of representatives of California oil-supply, manufacturing, and service concerns who had traveled outside the United States in the interest of their companies decided to join together in a permanent organization. Quite appropriately they called themselves Nomads.

The purpose of the club, the originators said, is: "To promote the spirit of cooperation and of good fellowship amongst its members and guests." A main objective is to expand and perfect the service rendered by American manufacturers to oil operators in foreign lands. Associate memberships selected by the active members include those engaged in the export operations of their companies.

The original club grew apace and at the dinner celebrating its first anniversary this month over 100 members and guests were present. The guest list included a number of oil men from all parts of the world.

During the year additional chapters have been installed, with headquarters at Houston and Tulsa. A national organization is being perfected. Arrangements are under way for the Nomads to take an active part in the entertainment of foreign guests at the International Petroleum Exposition at Tulsa May 18-25, 1940. Presidents of the three clubs are: E. L. Decker, Martin-Decker Corp., Los Angeles; Rex G. Hamaker, Reed Roller Bit Co., Houston; and Fred E. Cooper, Fred E. Cooper Co., Tulsa.



(Continued on Page 153)

CAMERON PRESSURE DRILLING CONTROL

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The fast, positive, unfailing control provided by Cameron Series 900 A.P.I.—6,000 lb. test—Pressure Operated Blowout Preventers, Master Gate Valves and Flow-Line Gate Valves has won the unqualified endorsement of drillers, tool pushers, superintendents and others responsible for the safe drilling and completion of high pressure wells.

THEY CLOSE INSTANTLY—Hydraulic pressure supplied by boiler feed pump, slush pump, or both, controlled by a 4-way valve within easy reach of the driller, closes rams instantly when pressure is applied.

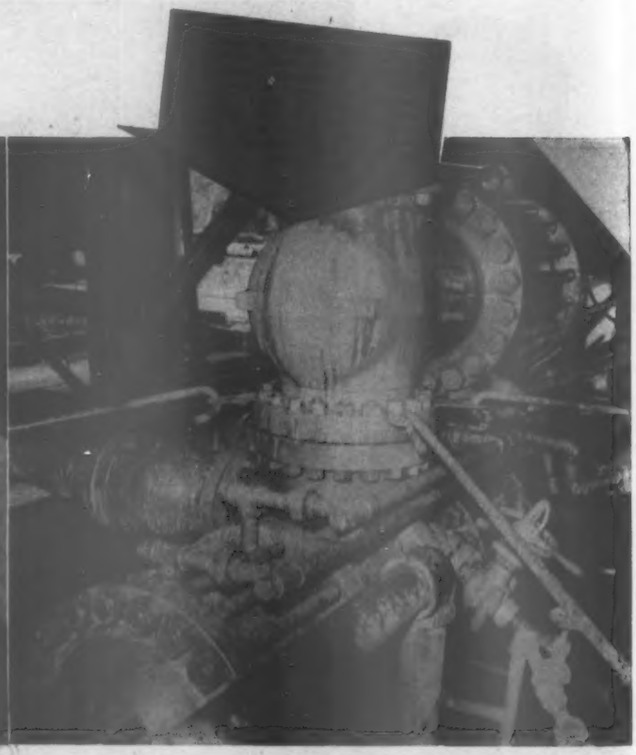
REMOTE CONTROL—Cameron Pressure Operated Blowout Preventers and Gate Valves are remotely controlled from the derrick floor . . . crew members are not required to enter the danger area under the floor to close them.

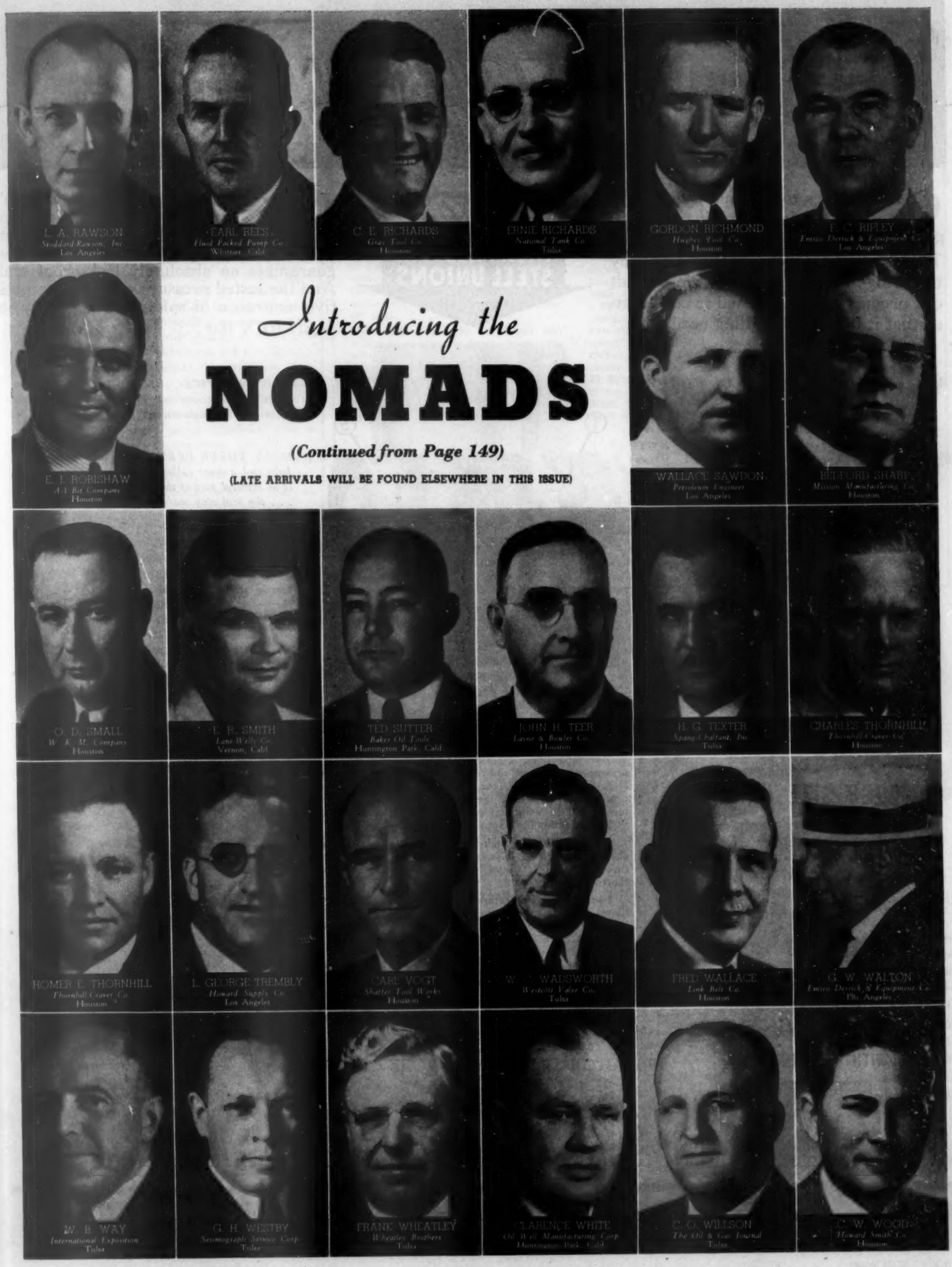
POSITIVE SEAL—Self-Feeding Ram Packing Element makes positive shut-off and permits pipe movement under pressure. This tough, steel-reinforced block of special formula rubber, or neoprene if specified, represents the longest forward step in blowout prevention devised in a decade. It is designed so that when rams are closed rubber is forced to flow to the pipe, where it makes a pressure-tight seal. Each packing element contains many cubic inches of rubber in reserve which, as needed, is automatically fed out to the pipe. This simple but extremely positive ram packing gives drilling crews complete confidence in their ability to shut-in the worst blowout. Angular wing guides, made integral with Type SDA Blowout Preventer rams, automatically center pipe in the hole and totally eliminate danger of rams being held open . . . a frequent cause of loss of control when ordinary control units are used. The wing guides are sufficiently heavy to withstand accidental shock loads, and insure positive closure.

NO UPSTREAM OR DOWNSTREAM SIDE—A Type SDA Preventer may be used right-side-up or up-side-down, if desired, since well pressure is not utilized to effect a positive seal of the annular space.

INTERCHANGEABLE RAMS—Rams to close around many different sizes of pipe are quickly interchangeable in any Cameron Type SDA Preventer. If desired, blind rams to make a full closure of the well bore with pipe out of the hole may be substituted for pipe rams.

Fully descriptive literature, covering numerous other exclusive features of these famous drilling control units, will be gladly sent on request.





Introducing the
NOMADS

(Continued from Page 149)

(LATE ARRIVALS WILL BE FOUND ELSEWHERE IN THIS ISSUE)

IT'S RED-REX QUICK JOINT PIPE UNIONS 100%

ON new rigs today, many operators are specifying that *all* unions be RED-REX Quick Joint Pipe Unions. This demand for "RED-REX 100%" by the firing-line buyers is the logical result of a product so designed and so constructed that it fills every drilling need.

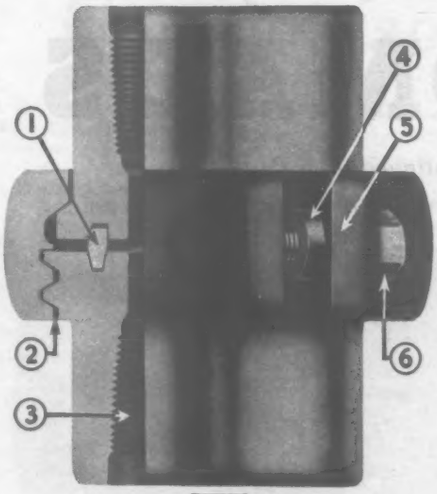
Red-Rex HIGH PRESSURE STEEL UNIONS

IN gas re-cycling plants, where leaks can't be tolerated, and where pressures are important, it's RED-REX again. The patented seal ring, with its three tapered sides, guarantees an absolutely leak-proof seal. And the tested pressure ratings give positive assurance of safety. That's why its "RED-REX 100%."

1.—SEAL RING AN EXCLUSIVE FEATURE . . . Three tapered sides provide leak-proof seal under high temperatures and pressures; one straight side wedges ring tightly into hub . . it can't fall out.

2.—TAKES CARE OF EXPANSION . . . Loose Threads between draw collar and hub allow for contraction and expansion and permit misaligned hubs to be drawn together.

3.—PERFECT THREADS . . . Every Red-Rex Pipe Union is tapped with lead screw engaged to insure close tolerances on leads.



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4.—IT WON'T STICK . . . A few left turns on the screw and the collar spins off. Corrosion won't stick it.

5.—ONLY THREE PARTS . . . Two hubs and a draw collar. The screw is an integral part of the draw collar . . . the seal ring wedges tightly in one hub.

6.—IT'S QUICK . . . Tightening or loosening a single screw (125,000-lbs. tensile strength) makes or breaks the joint. As the split collar is drawn together, the hubs are forced into sealing position on the seal ring . . . with equalized pressure all around.

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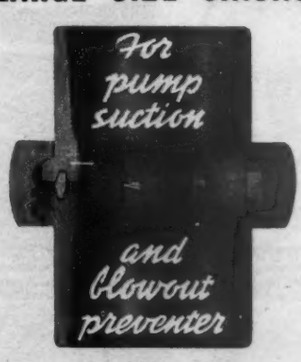

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For mud lines, super-heated steam lines—wherever pressures are highest and conditions most severe—it's the High Pressure Steel Union. This union is made in three pressure ratings: 1,000 lbs. working pressure—3,000 lbs. test; 3,000 lbs. working pressure—6,000 lbs. test; and 5,000 lbs. working pressure—10,000 lbs. test.

For tank battery hook-ups it's the Malleable Union shown at the right. It is rated at 500 lbs. working pressure—1,000 lbs. test, and is made in both the long and short-hub design.

For Blowout Preventers it's the "Large Size" Unions shown at the left. And when used in conjunction with the blanking plug, also shown, this "Large Size" Union is the universal choice for Pump Suctions.

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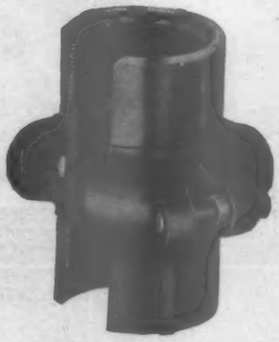

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BRAZIL'S OIL SEARCH

(Continued from Page 69)

gaged in plain wildcat operations and no great results should be expected in the near future, nor should it be cause to discourage the administration and the companies now engaged in the search for oil in Brazil.

Geology

Alagoas basin is just one of the many basins formed along the coastal belt. It is in a large part obscured by a mantle of Pliocene material known as "the Barreiras formation" which varies in thickness from 1 to 150 ft. The rocks are of Eocene age, while in Sergipe and Bahia, south of Alagoas, the Cretaceous predominates. The few exposures of outcropping formations are far between along the shore line and afford but small opportunity for geological study. However, eight or nine wells have been drilled in Alagoas and considerable geological information has been obtained. It is not possible at this moment to give more than a brief outline of geological conditions without taking into consideration the rich organic sediments such as oil shale, impregnated limestones and sandstones. In spite of the amount of drilling which has been done, details of stratigraphy have by no means been established and many major problems remain unsolved. This is due to the complicated structures, lack of well-defined markers and frequent transgression and lateral variation of sediments. The general stratigraphic section known of the basin of Alagoas, from top to bottom is as follows:

Pliocene—The formation locally known as the Barreiras; it is a thin deposit of fine colored sands, clay and conglomerate.

Eocene—Eocene rocks outcrop along the coast and several wells drilled into Eocene have obtained good showings of oil and gas at comparatively shallow depth. This formation is mostly composed of sands, oil shale conglomerate and limestones.

Cretaceous—Cretaceous rocks are the oldest known in the basin and predominate in this formation, sands, clay and limestones. Its outcrop is to be found at the southwestern corner of Alagoas, about 70 miles from Maceio, capital of the State of Alagoas.

Pre-Cambrian—Pre-Cambrian rocks are in contact with the sedimentary formation some 35 miles west and in certain places the sedimentary rocks advance further than 200 miles. The pre-Cambrian rocks run parallel to the coastal belt of sedimentary formation and are mostly composed of granite, syenite, gneiss and schists.

Structure

The structures are complicated and much broken by faulting, which probably plays a major part in oil accumulation. All of these structural movements acted throughout the coastal belt alongside the Atlantic. In some areas in the State of Alagoas the effect of the southwest folding predominates. Geophysical methods such as the seismic, magnetometric, geoelectric and gas have been used by well-known German and American physicists contracted by the government. All of these methods correlated many petroleum structures, including one main anticlinal fold with several domes. The basin offers a diversity of structural conditions. The region has been embayed by the sea many times and the folding and twisting of strata resulted in all kind of impor-

(Continued on Page 158)

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Designed for production drilling for depths of 3500' to 4000', drilling 6¼" hole. This model is mounted on either truck or trailer and is equipped with a 60' collapsible mast, Timken bearing equipped oil bath rotary table with hole opening for setting 10" pipe, 8 speed drawworks (4 speeds through friction clutch and 4 speeds through jaw clutch) with drum speeds from 173 to 27 RPM. Drawworks and rotary table driven by independent power unit. Slush pump and engine mounted on steel skids as a separate unit.

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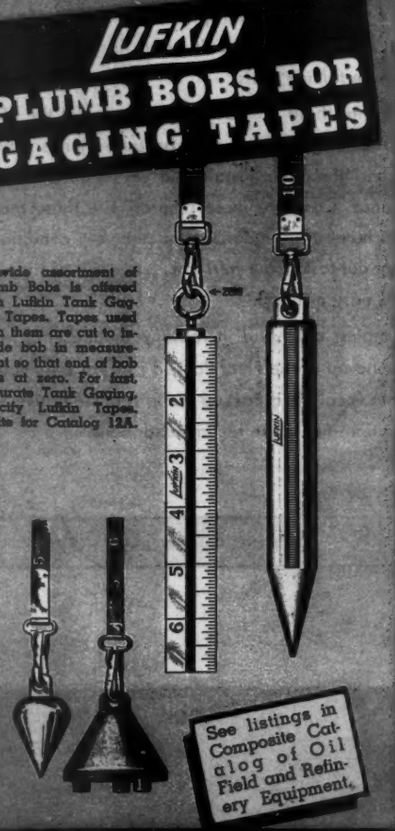

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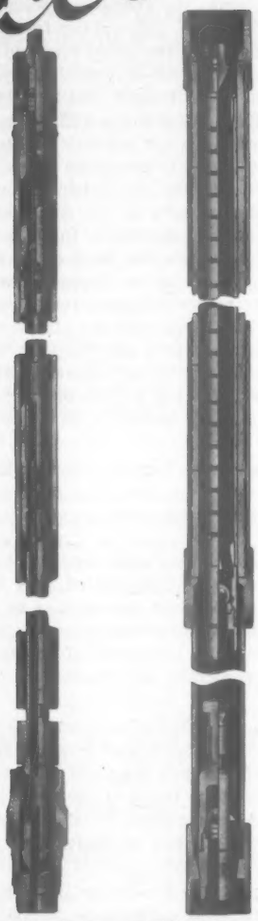
Fluid Packed Pumps are described in the Composite Catalog, pages 670 to 675!



"Improved Insert" Flupaco Pump is the newest addition to the Flupaco line. Its *one-piece Hardened and Honed alloy-steel* barrel assures rigid alignment under all conditions. It has no joints to leak or liners to break, and will stand repeated rehoning. Also furnished in non-corrosive material.

"Tubing Liner Pump" embodies the latest design and construction features. Because of higher quality it will reduce pumping costs on all wells where tubing liner pumps can be used. The automatic Standing Valve Puller insures against loss of the standing valve body when running in or out of well.

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"Producer." An insert pump for wells of medium volume and depth. Has plungers of "Service" or "Supreme" alloys—wear-resistant and durable. Also has largest cross-sectional area available in insert construction.

"Positive Pull Type." For general pumping conditions, this pump is recommended wherever the insert feature is desired. The entire assembly goes in and comes out on the rods, giving positive pulling action.

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"Rigid Type." Recommended for extreme sand or viscous oil conditions, this pump is securely anchored to prevent its pulling off the seat. Only the traveling tubes come out on the rods, assuring positive hold-down efficiency.

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(Continued from Page 155)

tant structures for the accumulation of petroleum. Appropriate source rocks are to be found and wells drilled by the author's company have encountered numerous showings of oil and gas in sands of good reservoir character.

Of the most favorable areas believed to exist, two (Alagoas and Bahia) will be thoroughly tested. Deep drilling has already been started and all indications are that oil in commercial quantities may be found. Petroleum development in Brazil will open a new country which will prove fertile for the physicists and geologists, as the areas and structures discussed here are only a few of the many that seem very promising to search for petroleum.

Questions and Answers

Questions asked of the Conselho Nacional do Petroleo by the author and their answers are:

Does the government within the present legislation wish to restrict the development of oil fields?

Answer: The government is interested in furthering as much as possible the prospecting for petroleum and natural gas in all the territory of the republic and for that reason the administration (government) has issued the laws No. 1,217 of April 24, 1939 and No. 1,369 of June 23, 1939; attributing to the Conselho Nacional do Petroleo all matters pertaining to the granting of concessions for prospecting and exploration, not only of oil and gas, but also of bituminous shales, having in view just to facilitate the granting of such concessions by simplifying the process which will now be dealt by just one public department.

With the same view the last of the abovementioned laws transferred to the Conselho Nacional do Petroleo all the service of prospecting for oil, which up to then had been with the Ministry of Agriculture. Therefore, it is understood that the government is very much interested in furthering by all means the prospecting for oil and will also facilitate matters in order to interest private capital.

Within the last 6 months how many concessions for oil prospecting and development have been applied for and how many have been granted?

Answer: Within the period to which you refer, 36 leasing requisitions have been placed before us. The administration has allowed 22 permits; seven failed to fulfill the legislation and the rest are still under consideration, awaiting the fulfillment of formalities. Regarding exploitation, the government received during the same period two requisitions which were granted.

Government-Directed Exploration

Does the government intend to go into the petroleum exploration and to refine it only for the consumption of the army and navy or for general use?

Answer: Should the government wish to industrialize the oil in accordance with the Article 13 of the Law 538 of July 7, 1938, it will naturally take care of the army and navy.

In case the government should industrialize petroleum, does the administration intend to create its own distribution?

Answer: Our legislation has no restrictions of any kind regarding distribution. Natives and foreigners alike can distribute the products of petroleum, once they have satisfied the regulations of the Decree 4071, of April 12, 1939. However, should it be to the interest of the nation for the government also to distribute petroleum products, we shall do so, but so far no thought has been given to the matter.

Eventually, does the Conselho wish to create monopoly of refining and exploration?

Answer: Not at all.

PROGRESSIVE MILLING

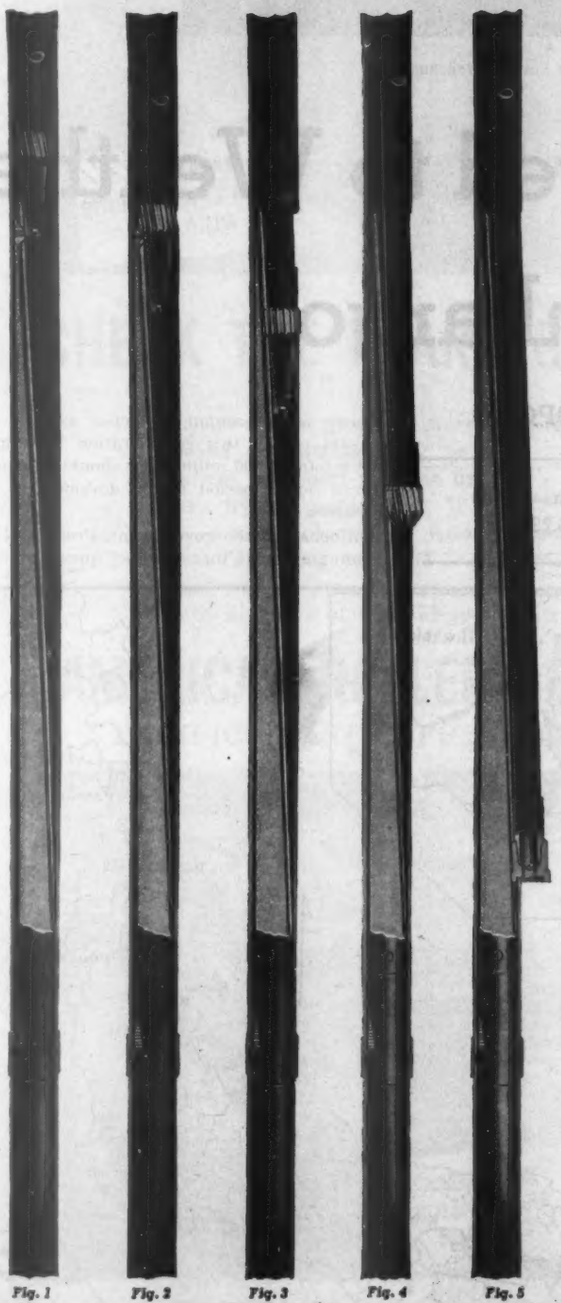

Fig. 1 Fig. 2 Fig. 3 Fig. 4 Fig. 5

SOLVES DIFFICULT SIDETRACKING PROBLEMS

The tools and method of successfully sidetracking through Grade D and special alloy casing by progressive milling were developed by Kinzbach following years of experience in combating abnormal sidetracking problems. The tools include the Kinzbach Type "H" Whipstock and Types "A", "E" and "F" Kinzbach Mills. The method, long since proven and now widely accepted, is pictured in the five accompanying illustrations (left).

Type "H" Whipstock is the same design of the Kinzbach Type "A" except that Type "H" has the pilot lug added to the top of the concave section.

Fig. 1 shows Whipstock set in casing, setting tool being integral with starting mill (Type "F") and in position to shear loose from Whipstock. After shearing, the pilot on mill engages lug on Whipstock, forcing mill to cut through pipe wall by contact with taper on pilot of mill without permitting mill to cut Whipstock.

After body of mill reaches lug on Whipstock (Fig. 2), pilot takes up space between lug and inner pipe wall, forcing mill to cut off lug, which is no longer necessary. The pilot mill may then be run for some distance below the lug (Fig. 3); then removed from hole.

Type "A" mill is used next in the progression of tools (Fig. 4), running from the point where pilot mill was removed. The window may be finished with this type tool unless difficulty is encountered in holding it in to cut out bottom section of window.

For maximum length of window it will be necessary to use Type "E" mill for the last operation (Fig. 5). This mill cuts a short core, which is in turn milled up by the inserts This core serves to hold mill in position against face of Whipstock, and is of such length and shape that a second mill of same type will go directly back to its proper position for a continuation of the cut without interference from the core.

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Top of window is positively above top of Whipstock and is opened rather abruptly, eliminating long slivers of pipe at this point.

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Type "A" Mill

Type "E" Mill

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View of the large shale-oil extraction plant at Fushun, Manchuria

Japan Is Ill Prepared to Weather Potential U.S. Embargo

By HERBERT LEOPOLD

NOTE: Par Value of Yen—$.4982
Present Quotation—$.2349

THE year now drawing to a close was devoid of important technical oil developments in the Japanese Empire. Crude production in Japan witnessed a drop which helped to increase the empire's dependence on foreign supplies. A large Cross cracking plant was completed, and two polymerization plants are nearing completion. Coal liquefaction projects, in which Japan has invested several hundred million yen, have not yet advanced to the production stage, and are unlikely to contribute substantially to Japan's fuel supply within the next 2 years.

In the 2½ years which have elapsed since the outbreak of the China "incident," the Damocles sword of an American embargo on oil shipments to Japan has been hanging ominously over Japan's militarists, and the danger that the hair may snap is increasing as the dead-line date of the expiration of the American-Japanese Treaty of Commerce and Navigation (January 26) nears. If and when an embargo comes, both the United States and Japan will lose, but for Japan the consequences must be disastrous. Her efforts to open up independent sources have not borne fruit but dependence on American supplies has increased to more than 80 per cent of her total imports.

Parliament Votes Prospecting Subsidies

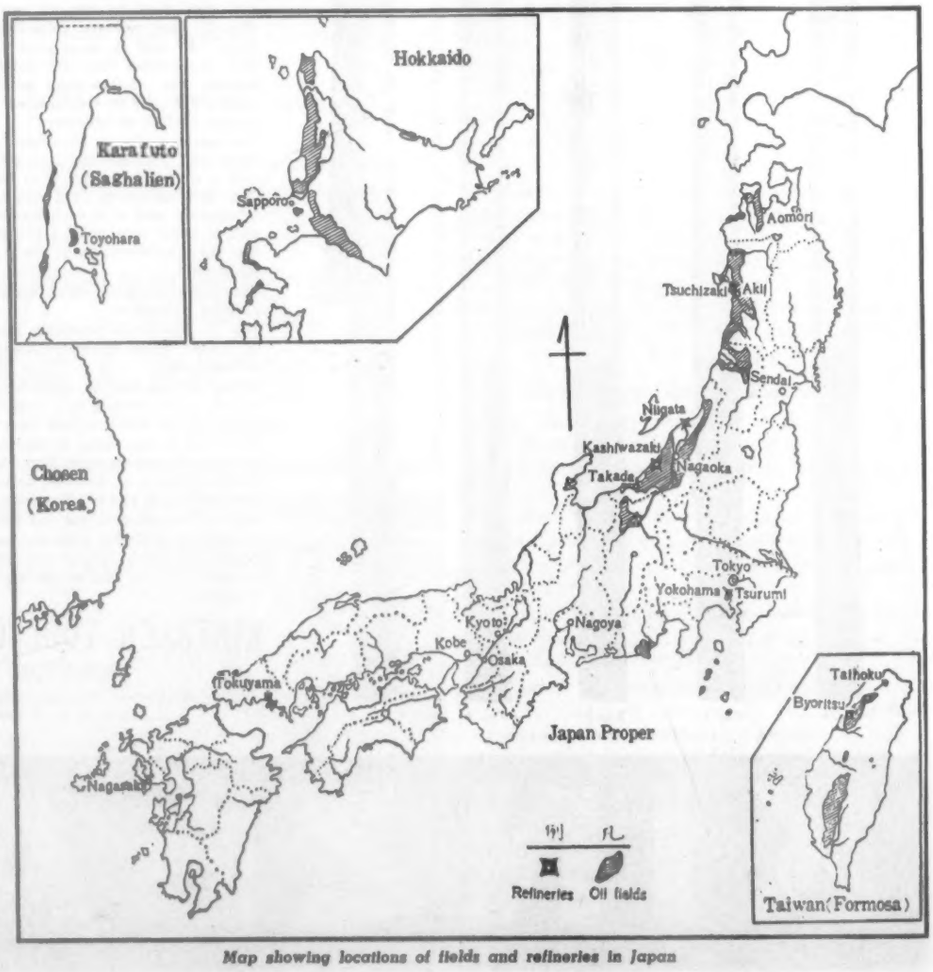
The question of Japan's ability to meet fuel needs especially with regard to the necessity of her command in the Pacific was raised in the House of Peers early this year by Baron Toshiatsu Sakamoto in the course of an interpellation.

"We know," he said, "that Admiral Yonai, the navy minister, told us the other day that we might rest assured as to the defense of the Pacific. Are we to understand from his statement that we feel secure as to the fuel question relating to the sea power of our country?"

Referring to American plans and proposals to fortify Guam Island and the Aleutian Islands, Baron Sakamoto asked if the authorities were taking proper measures about petroleum resources, the internal output in the country being only 10 per cent of the requirement.

He thought that the estimates budgeted for the subsidies for the development of oil resources were decidedly too small. The proposed appropriations should be raised two or three times as much in order to increase oil production as many times, he said. From this consideration he suggested that a total of 300 million yen should be expended over a 5-year period to aid development of oil resources.

On behalf of the government, Premier Kiichiro Hiranuma stated that the fuel question was far



Map showing locations of fields and refineries in Japan

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from being neglected by the government, fairly substantial appropriations being asked for under the new fiscal program. Yoshiaki Hatta, commerce and industry minister, hoped the country would attain a self-sufficient position in fuel in the nearest possible future. He believed the petroleum reserves in the country were by no means scanty as thought by some and the government was ready to increase its subsidies with the progress of geological research now under way.

Appropriations for the 1939-40 operating year were subsequently set at 6 million yen, to cover the cost of 102 test wells. Drilling was undertaken in the Akita, Tsuchisaki and Nagaura districts, but the results have not been revealed. Great activity was witnessed in the Kotaki field, where several wells came in at comparatively low depths. Oil was struck at three places in the Omono River district, Akita prefecture, only 300 ft. deep. Altogether 1,896 wells were in operation in Akita prefecture in May this year, an increase of 102 wells over May 1938. But only 12 wells were new producers, against 15 in 1938. Kokuni-Innai was the leading field with five producing wells, followed by the Yabase field with four wells, and the Yuri-Michikawa field with three wells.

The Japan Petroleum Co. started work on a 12,000-ft. well at its Kinsui oil field in Formosa, and on several other wells of more than 10,000 ft.

Deep drilling was resumed in superannuated fields in Niigata prefecture, where wells were extended by 3,900 ft. to a depth of 4,500 ft. in the hope of striking secondary beds.

Production Bogs Down

The net result of these and other efforts to push production was not altogether comforting. Though fields of some promise were reportedly discovered and partly developed, shortage of labor and steel materials had an extremely unfavorable effect on field operations, and it is estimated that crude output for the year will remain below, or at best equal, that of 1936. The publication of mineral statistics was suspended in August 1937 and exact figures are therefore unavailable. The general trend of crude-oil production since the outbreak of the Sino-Japanese hositilities is, however, sufficiently known to enable close estimates to be made. Output for 1937 advanced approximately 10 per cent over 1936, although a reaction set in late that year. The decline then continued at an accelerated pace, with the net result that Japan is now back to the point where she started when the China "incident" got under way.

Crude-oil production in Japan in recent years, converted from Japanese units into barrels of 42 U. S. gallons, was as follows, including estimates for 1937, 1938 and 1939.

	Barrels
1931	1,966,000
1932	1,630,000
1933	1,455,000
1934	1,834,000
1935	2,250,000
1936	2,445,000
1937	2,689,000
1938	2,823,000
1939	2,400,000

Sakhalin Concessions Issue

So far as Japanese import statistics are concerned, it is customary to include the output of the Kita Karafuto Sekiyu K.K. (North Sakhalin Petroleum Co., Ltd.) in crude production for Japan. However, Sakhalin oil is not included in the above figures. Although the Japanese foreign office again frequently denounced the Soviet authorities for alleged interference with the operation of Japan's concessions there is no positive evidence that the leases have actually lost their value as an important source of Japanese crude-oil supply. The operating company has not published output statistics for the past several years, but it is estimated that shipments from Sakhalin in 1938 aggregated 250,000 tons, or approximately 1,750,000 bbl., and this year's shipments are expected to reach the same total.

It appears that the principal grievance of the Japanese is the refusal of the Soviet to sell oil from such fields as they operate themselves. Until a few years ago they did not have much use for the crude oil and sold a large portion of it to the Japanese on very favorable terms. With the completion of a large refinery at Khabarovsk in 1936 a more useful outlet was found, and the Japanese have since been unable to send home more than they produce.

The narrow semiarctic strip of land on the eastern coast of North Sakhalin, on which Japanese and Soviet oil fields are strategically spotted in checker-board fashion, is likely to remain a severely contested bone of contention between the U.S.S.R. and Japan.

It is the only productive oil area outside of, but within economic distance from, oil-hungry Japan; and Nipponese enterprise has contributed much to its development. To the Soviet, the Japanese concessions are an undesirable vestige of capitalist enterprise, wrested from the hard-pressed Kremlin in the early 'twenties at the point of the bayonet; and, if not for ideological reasons, they would like to abolish them in order to increase their own oil supplies in the Far East. The industrial development of eastern Siberia has uped oil consumption beyond the capacity of the Soviet-managed Sakhalin wells to produce, and while the Japanese are carrying away crude oil from Sakhalin, Siberia is importing crude oil and gasoline from California. The chronic tension over the Sakhalin leases is hardly likely to subside unless new important oil discoveries in the Soviet Far East should divert the Kremlin's interest from this easternmost mineral treasure of the Soviet Union.

The Japanese-owned Compania Veracruziania began to drill for oil early this year in concessions which it obtained in Mexico in 1937, according to a report circulated here. The company's properties on the Isthmus of Tehuantepec, near the expropriated lands of the Mexican Eagle Co., cover 10,000 acres, and the Japanese were trying to obtain further concessions of 200,000 acres in that region. It was understood that the concessions included a cooperative arrangement with the Mexican Government.

The Japanese are importing drilling machinery, and have contracted with a Mexican firm for the drilling of a maximum of 20 wells a year. The Japanese company is financed with $15,000,000 provided by the Chunanbei Crude Oil Importing Co., which is affiliated to the Nippon Soda Co. in Tokyo. The company has some Mexicans among its officers. The same company also attempted to swap soy beans for Mexican crude, but the deal was blocked by the Cardenas government.

The plans of the Japanese to build a pipe line from oil fields on the east coast to Salina Cruz on the Pacific are considered to be impracticable, because pipes laid in such marshy regions would deteriorate rapidly. If an important field were discovered on the east coast, the possibility of transporting the petroleum through the Panama Canal remains.

Unconfirmed rumors have it that a Japanese prospecting crew is also active in Iraq, under an arrangement with the government of that country which is said to provide for the possibility of lease contracts.

Firm to Produce Aviation Fuel

One of the largest cracking plants ever built in Japan was completed at Tsurumi, near Yokohama, by the Mitsubishi Oil Co., a joint enterprise of the Mitsubishi Trading Co. and the Tide Water Associated Oil Co. The plant is of the Cross type, and D. D. McGregor, until recently Mitsubishi Oil's vice president, was in charge of design and construction.

The same company has started work on the construction of a polymerization plant to produce isooctane aviation fuel, but the commercial success of the venture is doubtful in view of the small quantity and poor quality of cracking gases which are available at any given point in Japan. A second isooctane polymerization plant is under construction by the Nippon Petroleum Co.

Catalytic cracking, as an alternative method of producing aviation fuel, has recently caught the

Keisaburo Hashimoto, chairman of the board of directors of Japan's new fifty-million-yen East Asia Fuel Industry Co., which will produce aviation fuel by catalytic cracking. Mr. Hashimoto is also president of the Japan Petroleum Co.

Vice-Admiral Masazo Sakonji, president of the North Sakhalin Petroleum Co. Unfavorable publicity in connected with alleged Soviet interference with the company's operations helped its Y50-shares drop to Y40

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interest of military circles. Under directions from the army, eight leading producers and refiners jointly organized a 50 million yen concern to engage in catalytic cracking. The company, which was established in July, goes under the style of Toa Nenryo Kogyo K.K. (East Asia Fuel Industry Co., Ltd.) and has its head office in Tokyo. The joint investors include the Japan Petroleum Co. (whose president, Keizaburo Hashimoto, is concurrently chairman of the board of directors in the new company), the Ogura Petroleum Co., the Mitsubishi Oil Co., the Hayama Oil Co., the Maruzen Oil Co., the Niitsu Oil Co. and the Chosen Oil Co. The site of the plant will probably be near Osaka or Nagoya. Enpei Nakahara, of the Ogura Oil Co., is in charge of all technical affairs of the concern, and in this capacity he recently left for the United States to make arrangements with American engineering companies for delivery of the requisite designs and equipment.

Restrictions on consumption of gasoline for other than military purposes were considerably tightened in the course of the year, and substitute fuels, ranging all the way from solid substances, such as wood and charcoal, to compressed gases, became an increasingly important factor on the market.

Installations of charcoal-gas generators to buses, trucks and even passenger cars have become a common sight, and several prefectural police authorities have revised regulations governing the handling of compressed gases to enable vehicle operators to carry a supply of natural gas, town gas or producer gas in steel containers. The opening of several "gas" stations has been licensed. Carburetors have become a useless encumbrance, and it was reported early this year that the Tokyo Metropolitan Police Board was refusing to accept new registrations unless the cars submitted for inspection had this device removed as bona fide evidence of the operators' intention to run on substitute fuels.

Power Alcohol Production Increases

The scant rations of gasoline which are still allowed to the public are "stretched" with alcohol. The blending ratio has been steadily increased, from 5 per cent for one-fourth of the filling-station gasoline, to 10 per cent of all gasoline. It is planned to increase the ratio to 20 per cent. Five plants for the production of power alcohol were completed by the Ministry of Finance (it's a government monopoly since 1936) in 1937, six in 1938, and more than 10 were either completed or under construction by the end of 1939. The government program provides for a total of 60 plants by 1943, each capable of producing 3,600 kl. annually.

Further rapid development of alcohol production will depend on Japan's ability to produce enough of the requisite starting materials (potatoes, sweet potatoes, molasses), which appears a difficult task in view of the recent downward trend of agricultural production. Efforts have been made to lighten the burden on Japan's farmer, and several plants were to be built to treat wood shavings and sawdust. But here Japan's dependence on German engineering assistance is interfering with the plans. One Scholler plant was nearing completion in Korea last summer, but the outbreak of the European war halted the construction work.

The European war likewise has been the cause of a further delay in the completion of several coal-liquefaction plants.

Coal Lubrication Program Flops

According to a 7-year plan laid down in 1936, Japan and Manchukuo are to produce 2,000,000 kl. of synthetic fuels by 1943. This amount, together with power alcohol and other substitute fuels, was expected to meet 50 per cent of Japan's fuel requirements in 1943, which were set at 2,470,000 kl., against an actual demand of 1,350,000 kl. in 1936. The tenure of the plan was later reduced to 5 years, so that Japan and Manchukuo ought to be able jointly to turn out 2,000,000 kl. of gasoline and heavy oil by 1941. Even if the less ambitious 7-year plan is checked against actual results, one is tempted to ask whether the Tokyo planners have not allowed their slide-rules to run away with the logic.

On the basis of this unabridged plan, 103,800 kl. should have been produced this year by hydrogenation, 104,000 kl. by Fischer-Tropsch synthesis, 10,300 kl. by low-temperature carbonization and 60,800 kl. by conversion of agricultural products into alcohol, making a total addition of 278,900 kl. In 1940 this should increase to 523,700 kl. These figures are for Japan only and do not include Manchukuo's share in the program.

As things go, only alcohol production has roughly approximated the expectations of the planners. One or two carbonization and distillation plants, which have been in operation for years, have been expanded, but their output is insignificant and almost entirely consumed at the plants. Neither hydrogenation nor Fischer plants, several of which are under construction, are operating yet, and while in the past the shortage of foreign exchange, and the resultant inability to import construction materials quickly, was mainly responsible for the delay in the completion of the plants, the outbreak of the European war has introduced additional difficulties, including the problem of getting German equipment to Japan and of paying for it with Manchurian produce.

Substitute Fuels Penetrate Market

A fully developed coal-liquefaction outfit would be of little practical use, anyway, at the present moment because of the acute shortage of coal, of which 4 tons are required to produce 1 ton of liquid fuel. Coal production has bogged down alarmingly, with the result that consumption had

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to be curtailed in all fields of industrial consumption. The coal-liquefaction plans call for an increase in coal output by 8,000,000 tons a year, which is 12 per cent more than Japan, Korea, Formosa and Manchukuo are producing between themselves.

By and large, then, Japan is still very far from even partial self-sufficiency in mineral-oil products, and if the indications of the past 2½ years say anything, the materialization of the coal-liquefaction projects will probably be delayed the more urgent it becomes. If Japan were able to wind up the China "incident" quickly, and industrial production were allowed to return to a normal peace routine, many obstacles to the development of the artificial-oil industry would be absent; but in this case the need for an independent domestic oil supply would be less pressing.

Consumption of oil products in Japan has increased at a much faster rate than has domestic output of crude oil, with the result that dependence on supplies from abroad has increased rapidly. Authentic figures for recent years are:

	Consumption, 1,000 bbl.	Percentage supplied by domestic production (Japan proper)
1932	13,823	11.7
1933	15,593	7.8
1934	22,948	8.0
1935	25,327	8.9
1936	28,150	8.7
Jan.-June, 1937	18,200	6.6

The tendency has become still more pronounced since the outbreak of the Sino-Japanese hostilities, in spite of drastic restrictions on other than military consumption. Actual consumption for the past 2½ years is not even approximately known, mainly because of incomplete information about the amount of oil left in storage. The picture has also been obscured by the practice of Japanese military authorities in China to have supplies landed direct without transshipment through Japanese ports.

No Import Statistics Published

Japan has ceased publishing import statistics. So far as expenditure on imports is concerned, the following table provides a fairly reliable guide to the general trend of imports. The figures are based on the official trade returns of the Department of Finance, particularly on the section dealing with imports of "oils, fats, waxes and manufactures therof." A close scrutiny of the method of compilation reveals that the totals for "other oils, fats, waxes and manufactures thereof" closely approximate the expenditure on imports of mineral-oil products, calculated on a c.i.f. basis.

IMPORTS OF MINERAL-OIL PRODUCTS INTO JAPAN AND KOREA

(Million yen)

	1939	1938	1937	1936
Japan and Karafuto:*				
January-June	127	141	121	
January-September	190	226	194	
January-December		320	280	184
Korea:†				
January-June	6.7	6.6		
January-December		20.7	23.6	14.0

*Not including oil from Soviet Sakhalin.
†From countries other than Japan.

On the same basis, it is possible to trace the imports to their sources. In this respect, significant changes have taken place since the outbreak of the Sino-Japanese hostilities. Notwithstanding Japanese efforts to mitigate a potential American embargo on mineral-oil shipments to Japan by opening up new sources of supply, the United States' share in Japanese imports has actually increased, and is still increasing. The reasons are to be found both in the quantitative and in the qualitative changes in Japan's demand in recent years.

Netherland India and British Borneo were able to supply a considerable share of Japan's oil demand so long as this share corresponded to a minor portion of their own production. But Japan's oil demand has far outrun their increase in production, and although shipments to Japan are not substantially smaller than they were a few years ago, their share in Japan's total imports has declined from 27.2 per cent to 16.7 per cent.

IMPORTS OF MINERAL-OIL PRODUCTS INTO JAPAN PROPER BY COUNTRIES OF ORIGIN

	1938	1937
Total imports* (million yen)	320	280
	Per cent	Per cent
From U.S.A.	75.0	65.1
From Canada†	5.7	1.3
From Netherland India	13.7	23.0
From British Borneo	3.0	4.2
From Manchukuo (shale oil)	0.7	0.7
From Bahrein Island	0.6	0.2
From others	1.3	5.5

*Not including oil from Soviet Sakhalien.
†The increase in imports from Canada does not correspond to genuine Canadian exports to Japan, which consist of but small quantities of residual fuel oil. It is due rather to the increasing use that is being made by foreign carriers of Canadian ports as transshipment points so as to comply with American alien shipping regulations.

But the most important reason for Japan's involuntary reliance on the United States is that the United States is in the best position to supply those petroleum products which Japan needs most urgently to carry on her war in China. These include aviation gasoline, distillate and residual fuel oil, lubricants and crude oil, while ordinary motor fuel, the feature item in Dutch India exports, has been subjected to drastic import limitations.

U. S. Crude Imports Recede

Japanese crude-oil imports from the United States have markedly receded of late, from 13,691,000 bbl. for the first 6 months of 1938 to 7,844,000 bbl. for the corresponding period this year. The abrupt decline suggests that Japan is now well stocked up with crude and is importing only for immediate requirements. This view is supported by the fact that imports of finished products have increased.

A tendency has been observed lately on the part

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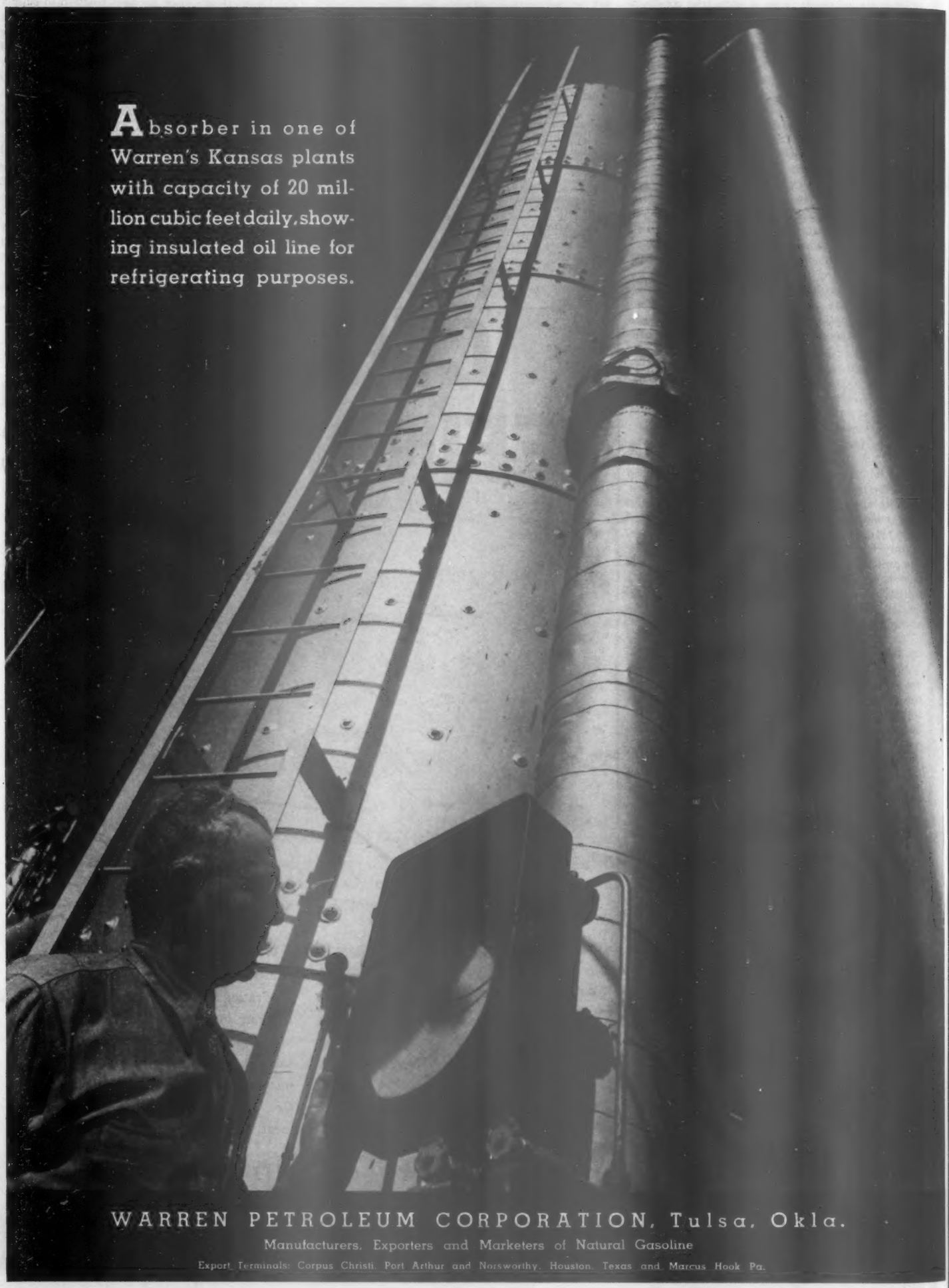
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of Japanese importers to cover a portion of their requirements outside of California, with interest centering on Texas. It does not seem, however, that the inroads on Californian business have been serious. Japan's ability to import from other supply centers will always be limited to the extent that tankers are available for the Panama route.

American Exports to Japan

According to officially compiled American statistics, exports of American mineral-oil products to Japan in 1938 and for the first 5 months of 1939 were as follows:

(Millions of barrels)

	1938	Jan.-May 1939	Jan.-May 1939 incl. Kwantung
Crude oil	21.29	6.82	7.26
Gasoline	1.45	0.58	0.90
Kerosene	0.88	...	0.21
Gas oil and dist. fuel oil	5.30	2.46	2.48
Residual fuel oil	3.03	1.94	1.94

An important, though officially hushed, news event of the year under review was the establishment in Tokyo of the Taiheiyo Sekiyu K.K. (Pacific Oil Co.) with a capital stock of 10 million yen for the purpose of swapping Japanese goods for mineral-oil products. The company is limiting its business to such countries as have not previously supplied oil to Japan, notably Iran, Iraq, Rumania, Ecuador and Mexico. The Taiheiyo is a subsidiary of the Ohji Paper Manufacturing Co., and it is believed that paper and synthetic fiber products are the principal barter items. Ohji's president, Ginjiro Fujiwara, recently went on a "pleasure trip" to Mexico, where he is believed to be sounding the possibilities of a deal with the government. Though past shipments of Mexican oil to Japan did not amount to very much, Mexico's present inability to continue business with Germany may make the government inclined to listen to the Japanese proposals, it is believed here.

Japanese exports of mineral-oil products have markedly picked up since the outbreak of the Sino-Japanese hostilities, but shipments were confined to Manchuria and those parts of China where Japanese troops are stationed.

Figures, in kiloliters, are:

	9 months 1939	1938	1937	1936
Crude and heavy oil	4,501	1,137	408	.....
Gasoline	20,455	17,960	302	532
Kerosene	14,433	20,195	16,969	63,838
Light oil	2,316	2,422	992	.....
Machine oil	24,413	30,423	19,975	41,176
Grease (100 kg.)	25,449	20,914	13,252	.....

The whole amounted in value to 5.3 million yen in 1936 and 1937, to 11.1 million yen in 1938 and to 15.1 million yen during the first 9 months of 1939.

Government-Managed Oil Distribution

As regards distribution, a phase of the oil business once more closely identified with foreign companies and representing the largest single foreign investment in Japan, the tendency continued toward elimination of alien interests. Manchukuo will shortly look back upon 5 years of government-managed oil distribution, and quasi-monopolies of varying exclusiveness have since been enforced in Korea, Mongolia, North China and Central China.

This year Japan came out with a project to place oil distribution within Japan proper under the control of a semigovernmental company, called the Japan Petroleum Joint Sales Co. The company was to open business on October 1, but friction developed with rural consumers, who refused to surrender their cooperative storage facilities to the prefectural subsidiaries of the governmental concern and to have the higher distributing cost shifted to their pocket books.

Though some changes may be made in the enforcement of the plan, the essential features, as embodied in a commerce and industry ministry ordinance, will probably remain. They may be summarized as follows:

1. To set up a large-scale central oil cooperative sales company, composed of oil refiners, oil import traders and those interested in artificial oil

2. This central company is authorized to conduct the exclusive domestic distribution of oil in accordance with the oil policy of the government authorities.

3. As a result, oil refiners, oil import traders and those interested in artificial oil here shall not sell oil to any other companies than the foregoing company, without permission given by the commerce and industry ministry.

4. The central oil company is allowed to supply oil to oil wholesale companies in each prefecture in compliance with the oil distribution plan of the competent authorities.

5. Without permission from the commerce and industry minister, oil supply to any other men and companies besides the designated oil wholesale companies is not permissible.

6. To set up a wholesale oil company in each prefecture by amalgamating the existing oil agencies into a single one.

7. In accordance with the oil distribution policy of each prefectural government, the respective wholesale oil companies are authorized to supply oil to retail oil dealers.

8. After proposing before the Oil Distribution Commission of each prefecture, the respective prefectural governors shall give approval to the draft plan calling for oil distribution.

9. The Oil Distribution Commission is to be composed of high officials of prefectural governments, representatives of oil supplying communities, and leading oil consumers (inclusive of representatives of the automobile, mining, manufac-

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turing industry, shipping, fishing and agricultural circles).

Oil-Distribution Problem

The oil distribution problem has also come to assume serious proportions in Thailand (former Siam) as the negotiations between the Thai Government and foreign petroleum companies on questions arising from the recent enforcement of the fuel-oil control law (which Siam almost literally copied from Japan) have been disrupted.

Immediately following the enforcement of the fuel-oil control law on July 15, the Asiatic Petrolem Co. (Shell) and Standard Oil Co. filed a protest with the Thai Government, declaring the provision of the law requiring the two companies to reserve always various kinds of oil to amounts equivalent to half of the annual imports disregards their interests, and demanded the Thai authorities to revise or abolish the provision. The two companies then threatened they would suspend oil supply in Thailand unless their demand was heeded.

It may be recalled that the foreign oil concerns in Japan have refused to this day to comply with the 6-month compulsory storage, which was enforced in 1935. But the Japanese Government was in a position to strike back by curtailing their imports because Japan is not dependent on foreign tankers and has access to independent producers in the United States and elsewhere.

The situation is vastly different in Siam, where there is neither a well-developed refining industry nor any storage space other than that owned by foreign companies. So the only outcome of the current strife that may be reasonably expected is a compromise under which the Thai Government builds its own storage facilities.

Research Critics on Aviation Fuel

Japanese fuel research in recent months was mainly concerned with seismic prospecting, shale oil, oil synthesis and hydrogenation, and aviation fuels.

T. Shono treated the gasoline and kerosene fractions from Shukkuko crude with various solvents, such as sulfuric acid, aniline, liquid sulfur dioxide and furfural, and observed their selective solvent action on the component hydrocarbons of the petroleum fractions. Y. Tanaka, T. Kuwada and M. Aoki succeeded in lowering the critical solution temperatures of gasoline-94 per cent alcohol blends and in increasing their stability by adding some higher alcohols, such as cyclohexanol and terpineol.

H. Ishibashi prepared high-speed diesel fuel from the gas-oil fraction of Fushun shale oil. He observed that the degree of refining the gas oil had a great influence on the combustibility of the product diesel oil. Thus he compared the combustibility of diesel oils produced by various refining methods. He adopted, as the refining methods, sulfuric acid washing, solvent refining, hydrogenation and hydrogenation followed by solvent refining. Among these, the last mentioned gave the best results.

The same author reported there was a certain relationship between the octane number of the cracked gasoline from shale oil and the cetane number of the cracked gas oil produced. That is, the sum of the above-said two values was in most cases approximately constant and amounted to 100-110.

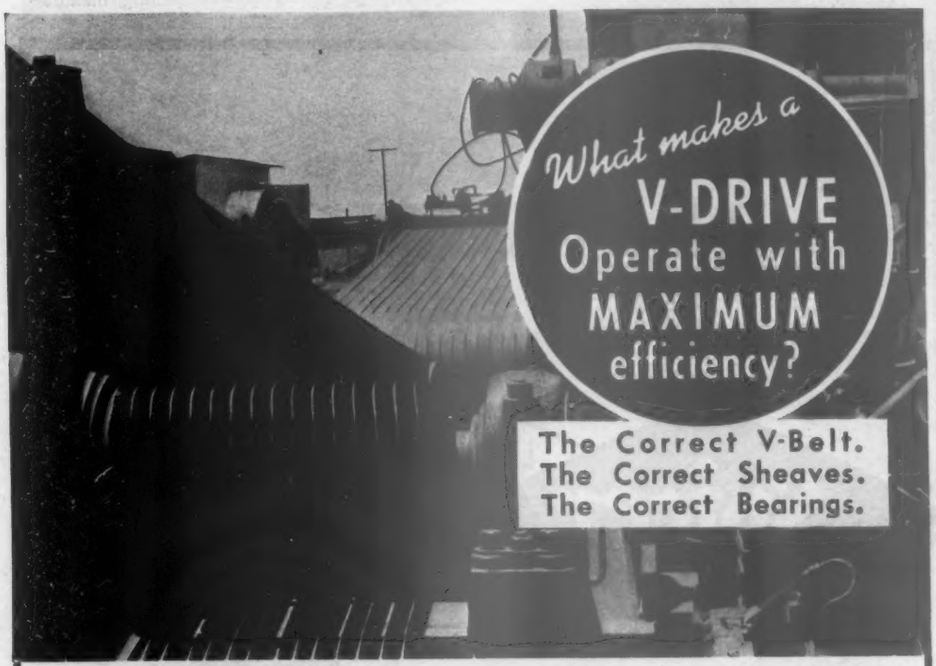
N. Kishi, H. Sotokawa and T. Uyeda have studied the refining of the kerosene fraction of shale oil. They obtained water-white and stable kerosene by using the modified Edeleanu process in place of the usual sulfuric acid washing. The kerosene fraction was treated with liquid SO_2 and further purified by alcohol-sulfuric acid mixture, and after filtration with Japanese acid clay and subsequent steam distillation, it became quite colorless and transparent. The authors, moreover, attempted to prepare gasoline and lube from the sulfur dioxide soluble fraction of the kerosene.

F. Horie and K. Morikawa studied the components of shale oil during several years. In a recent report, the components of the 200-240° C. fraction were observed. The fraction consisted of almost equal amounts of paraffins and olefins. Of the paraffins, n-$C_{19}H_{38}$ and n-$C_{18}H_{38}$ were isolated and identified, according to the Journal of the Fuel Society of Japan.

H. Kuwana and M. Imai of the Natural Gas Research Institute of the Taiwan Government-General, studied the thermal polymerization of natural gas. They investigated the best conditions of the heating time and the pipe diameter. They found a decrease of light oil and tar as pressure decreased.

Y. Konaka, of the South Manchuria Railway Co., continued his studies on the polymerization of ethylene at normal pressure. By Fe-Cu-U_3O_8 catalysts, he obtained 1.7 ccm. of liquid polymer from 18 liters of ethylene. As regards catalysts of the Ni series, by observing the phases of heat generation and the changes of volume, he detected the catalytic powers qualitatively, and found an Ni-Mn catalyst to be the best among them, and U_3O_8 or Al_2O_3 as the best promoters. By measuring the heat of reactions and the reactivities of hydrogen, he observed the temperatures and the velocities of reduction, and studied the relations between the activities of polymerization and states of reduction.

K. Shiomi and . Iwamoto, of the Natural Gas Research Institute of Formosa, studied the formation of aromatic poor hydrocarbon oil from acetylene and hydrogen, and found the Co-Ni-Cr_2O_3 catalyst to be the best, according to the Journal



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All Operations Gain In Venezuela

By LUIS HERRERA FIGUEREDO

Technical Service, Petroleum Inspector General,
Caracas, Venezuela

THE progress of the petroleum industry in Venezuela has been outstanding this year, many factors contributing to consolidate the position of this country among the high-ranking oil-producing nations of the world.

In addition to the extensive oil-development work of the various companies, the national government is carrying out large public-work projects in all parts of the country, especially in hitherto neglected areas, including highways, aqueducts, airports, hospitals, and sanitation improvements. The government is also encouraging the development of agricultural and mining properties, including the granting of subsidies through especially formed banks.

In an endeavor to present a brief picture of the recent oil developments in Venezuela, the writer will summarize separately the high points concerning each branch of activity in the oil industry.

Production

Total oil production of Venezuela in 1939 will be very close to the 208,000,000-bbl. mark. This figure shows an increase of nearly 20,000,000 bbl. over 1938 production, constituting a record for any one year in the history of the Venezuelan oil industry.

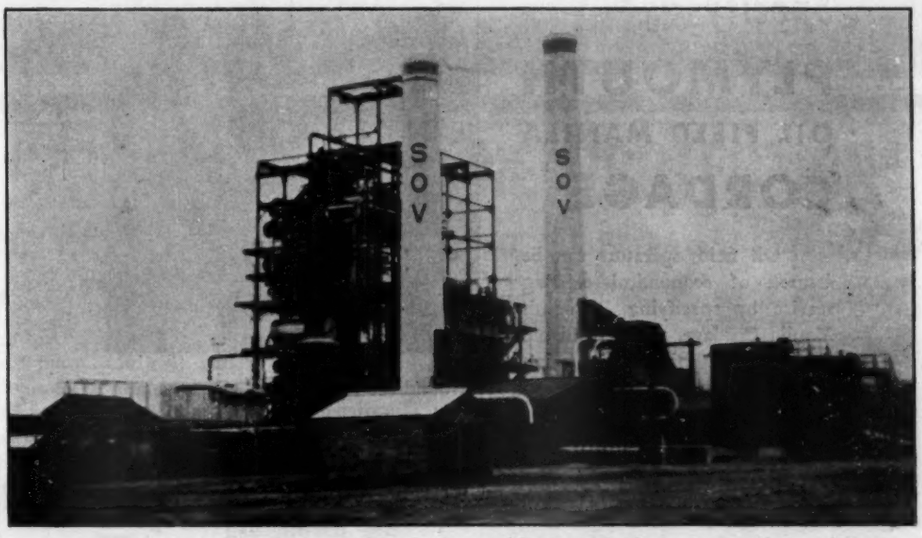
The individual trend of each producing field can be observed through the accompanying table, in which are presented production figures for the period January-September in 1939 and 1938.

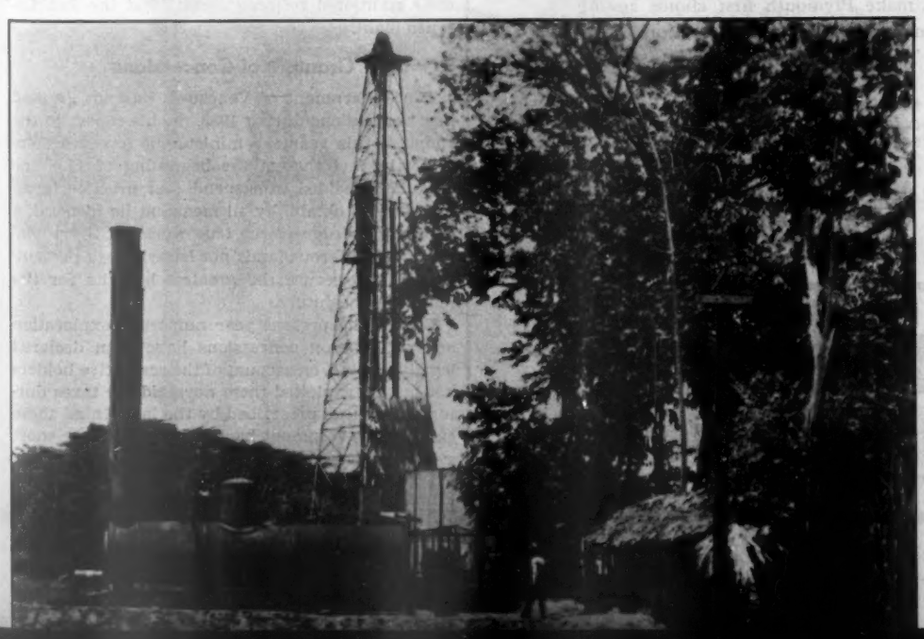
In line with production, crude-oil exports during the present year are expected to amount to 197,000,000 bbl., the highest total obtained for any one year in Venezuela.

Wildcat Operations

In addition to wildcats located more or less closely to already proven territories (see map), oil interests are attempting several exploratory tests whose results will furnish considerable information as to the magnitude of future oil reserves. Among them we should mention, first of all, those being carried out by the Guarico Oilfields of Venezuela and Socony-Vacuum Oil Co., Inc., in northern and southern Guarico, which will uncover the oil possibilities of Central Venezuela; next, the Alquitrana well, this being drilled by the Venezuelan Development Co., southwest of San Cristobal, in the folded zone of the Andes. Finally, No. 1 Cubagua, recently spudded in by a Venezuelan operator in the small island of Cubagua, southwest of the Margarita Island and about 55 km. due north of Cumana.

In the second half of the year, wildcatting programs have been curtailed to some extent on account of the changed situation in Europe, which turned the oil companies to be more interested in boosting up their present production by concentrating their drilling efforts in fields already developed. Nevertheless, a large number of field parties are, at present, working in various areas, paving the way for future development of additional acreage.





Left: Lago's Motatan No. 1 wildcat in western Venezuela, the deepest well drilled in this country (10,302 ft.). The well is now abandoned. Above: The new refinery at Caripito. This view shows the preheaters, high pressure stills

New Fields

During 1939 Oficina and Jusepin have definitely joined the list of producing fields in Venezuela.

At Oficina the Mene Grande Oil Co. is developing what promises to be the largest field in eastern Venezuela. Up to November 14 the company had completed 31 producing wells, while drilling was in hand at several new locations. The gravity of the oil encountered in the Oficina field ranges from 17.5° A.P.I. to as high as 44° A.P.I., most of the wells thus far completed being good for about 2,000 bbl. daily.

About 25 miles northwest of Oficina, the Mene Grande Oil Co. has another potential field, named Santa Ana, where the second and third wildcats are drilling at this time. Northeast of Santa Ana,

VENEZUELAN OIL PRODUCTION

Field—	Company	Production Jan.-Sept. 1939 (metric tons)	Production Jan.-Sept. 1938 (metric tons)	Per cent increase or decrease over 1938
Cabimas*	Venezuelan Oil Concessions, Ltd., Lago Petroleum Corp., Mene Grande Oil Co., C.A.	2,602,783	2,863,373	—9.1
Lagunillas	Venezuelan Oil Concessions, Ltd., Lago Petroleum Corp., Mene Grande Oil Co., C.A.	8,046,772	7,335,887	9.7
Tia Juana	Venezuelan Oil Concessions, Ltd., Lago Petroleum Corp., Mene Grande Oil Co., C.A.	5,743,388	4,665,781	23.1
Quiriquire	Standard Oil Co. of Venezuela	2,967,752	2,849,944	4.1
Mene Grande	Caribbean Petroleum Co.	1,342,378	1,392,704	—3.6
El Cubo†	Colon Development Co., Ltd.	575,272	515,901	11.5
Bachaquero	Venezuelan Oil Concessions, Ltd.	420,573	22,503	1,769.0
Temblador	Standard Oil Co. of Venezuela, Lago Petroleum Corp., Mene Grande Oil Co., C.A.	379,337	238,447	59.1
Cumarebo	Standard Oil Co. of Venezuela	248,715	242,089	2.7
Pedernales	Standard Oil Co. of Venezuela	207,874	205,872	1.0
La Concepcion	Venezuelan Oil Concessions, Ltd.	90,689	93,982	—3.5
La Paz	Venezuelan Oil Concessions, Ltd.	60,574	98,795	—38.7
Hombre Pintado	Central Area Exploitation Co.	48,542	13,836	250.8
El Mene	British Controlled Oilfields, Ltd.	41,155	53,907	—23.7
Las Palmas	Standard Oil Co. of Venezuela	5,718	5,407	5.7

*Includes La Rosa, Ambrosia, and Punta Benitez. †Rio Tarra and Los Manueles.
Note: Recently developed fields not included.

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in San Joaquin, four wells have been completed, production ranging from 600 up to 1,500 bbl. of an average 30° A.P.I. gravity oil, while another four new wells are being drilled in the site. North of San Joaquin the Standard Oil Co. of Venezuela is drilling under contract with the Pantepec Oil Co. the second well in the El Roble area, where the first wildcat proved to be good for 800 bbl. daily production of a 44.5° A.P.I. paraffin-base oil, second only to the light oil encountered in Cumarebo field.

The Jusepin field, 30 km. (20 miles) west of Maturin, where in July 1938 the first wildcat was spudded in, is now in regular production. The Standard Oil Co. of Venezuela had completed nine wells up to October 1, five new locations being drilled by that time. The operators expect to have 15 wells completed by January 1, 1940. Average gravity of oil produced at Jusepin field is 33° A.P.I.

New Pipe Lines

The 10-in. pipe line being constructed by the Standard Oil Co. of Venezuela, connecting up the Jusepin field with Caripito terminal, was completed toward the end of September and the first oil pumped through on September 21. The line is about 43 miles long, having a carrying capacity of 40,000 bbl. daily.

Pumping through the 96-mile-long 16-in. welded steel pipe line from Oficina field to the coast at Guanta was started in August. The construction of this line, shared by the Mene Grande and the Standard of New Jersey subsidiaries, was commenced in April 1939 and completion was scheduled for September 1. Outside the Oficina field, the line will provide an outlet for the oil proceeding from El Roble, Santa Ana, and San Joaquin fields.

Refineries

On October 21 the new refinery of the Standard Oil Co. in Caripito was officially inaugurated. The construction was accomplished in record time and completion effected several weeks ahead of the scheduled date.

The new plant, designed by the Standard Oil Development Co., is a combination topping and cracking unit, with a capacity of 31,000 bbl. throughput daily. Quiriquire field will furnish the crude to be processed, and the average yields are expected to be the following:

	Per cent
Gasoline (straightrun)	4
Kerosene	17
Gasoline (cracked)	10
Diesel oil	29
Fuel oil	40

At La Salina (State of Zulia) the Compania de Petroleo Lago (Standard) increased their refining capacity by installing a new 5,000-bbl. still. On the other hand, in the first half of the year the Caribbean Petroleum Co. (Shell) started operation of their additional refining facilities at the San Lorenzo plant.

Granting of Concessions

The Government of Venezuela has not granted new concessions during 1939. In his report to the congress this year the minister of fomento mentions the fact that at the beginning of 1938 the executive decided to suspend that practice in an endeavor to obtain, by all means at its disposal, a better knowledge of the true worth of the potentially petroliferous lands not leased up to present, in order to secure the greatest benefits for the nation in the future.

During the present year numerous exploration and exploitation concessions have been declared legally expired, on account of the respective holders not having exploited them nor paid the taxes during the periods prescribed by the law. In all these cases the government has moved within the most strict legality, inspired always by the sane desire to respect the juridical status of concessions granted hitherto.

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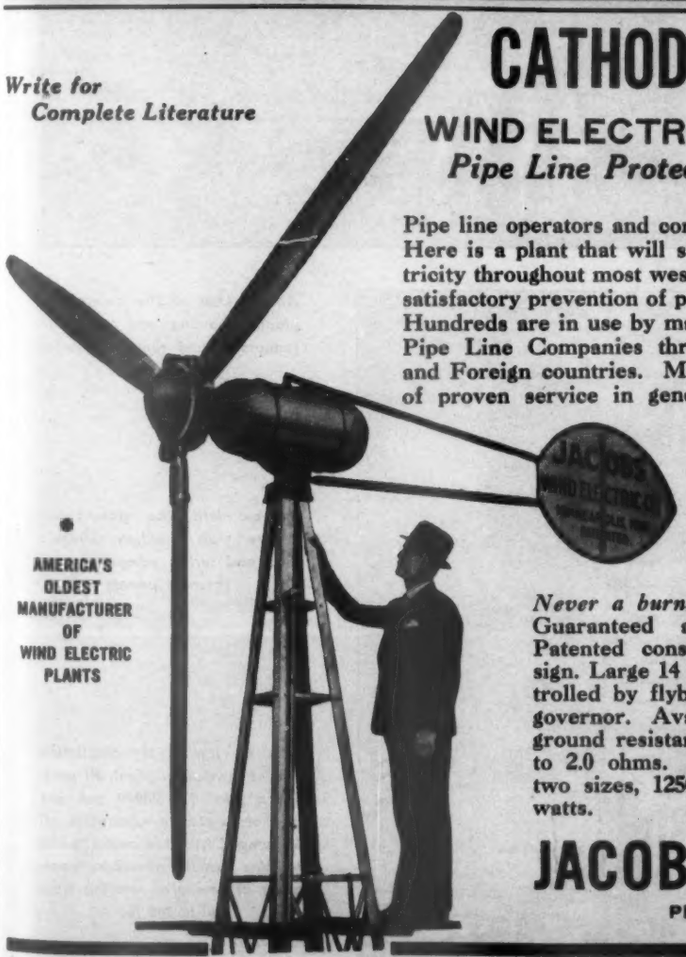

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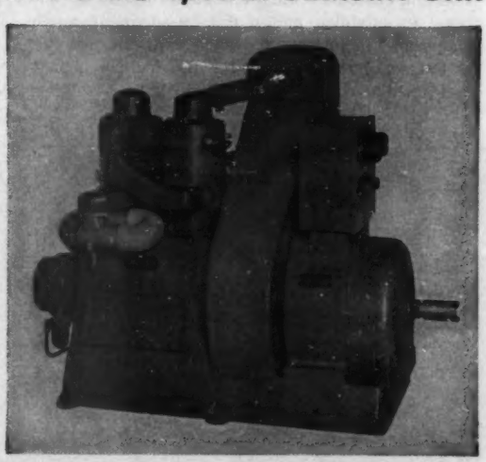
Never a burned out generator. Guaranteed against burn-out. Patented construction and design. Large 14 ft. propeller, controlled by flyball variable pitch governor. Available for all ground resistance from .08 ohm to 2.0 ohms. Manufactured in two sizes, 1250 watts and 2000 watts.

JACOBS *Special Cathodic Unit*



Engineered *exclusively* for the cathodic protection of Pipe Lines. Two years in development, Heavy Duty, Slow Speed, Few Moving Parts, No Valves, Gears, Belts or Pumps to wear out and cause trouble. Unequaled in long life, and freedom from attention. Gas or Gasoline operated. The patented design and construction of this entire engine unit was developed by our engineers. It is manufactured complete in our factory (not an assembled plant with engine or generator built by different companies). 2,000-watt generator. Engine 6 horsepower. Normal speed 500 to 600 RPM.

JACOBS WIND ELECTRIC CO., INC.

PIPE LINE DIVISION • MINNEAPOLIS, MINN., U. S. A.

Up-to-Date Methods Mark Operations in Peru

By A. D. LANDRY

Supt. Gasoline Dept., International Petroleum Co., Ltd.
Negritos, Peru

TO South American west-coast mariners a navigation light placed on a rocky elevation at the farthermost western point of the mainland is known as Parinas Point Light. This light is maintained and serviced by the International Petroleum Co. whose Peruvian operations are located within the 15-mile radius inland of the historic point.

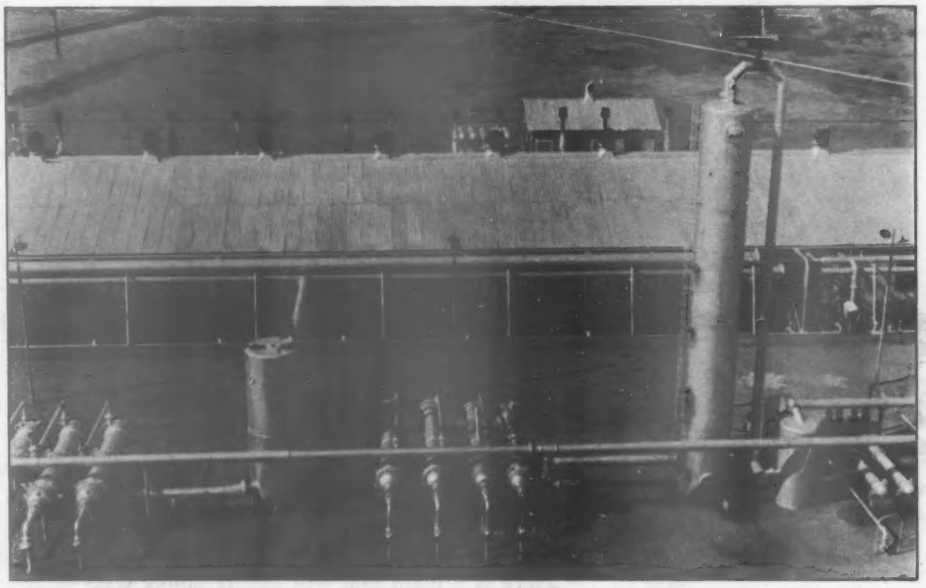
Just north of the point is the town of Negritos, the field headquarters, where there are housed approximately 15,000 Peruvians and 200 foreigners of Canadian, English and American citizenship. Negritos is not unlike old established petroleum towns in other parts of the world with its rows upon rows of uniform dwellings, and with one section of the town, a very large section, devoted to administration, factory, storehouses and other auxiliary buildings.

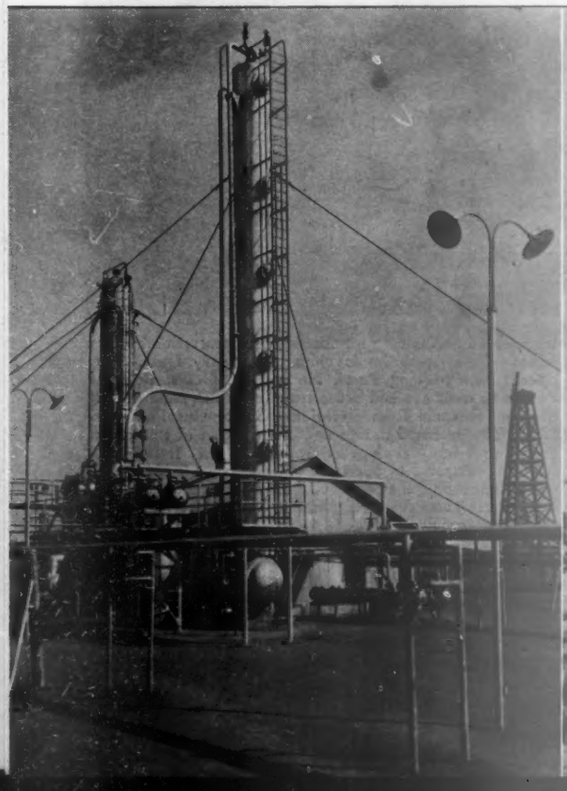
Asphalted roads lead from Negritos to all sections of the field and a narrow-gage railway supplements the motor roads to the main points. Both support heavy traffic in handling the transportation problems of a major oil field. Pictures of trucks and tractors sadly mired down in mud in the Illinois fields are a decided contrast to those vehicles doing the same work in the Negritos field where it seldom rains and a rail line leads to every new well.

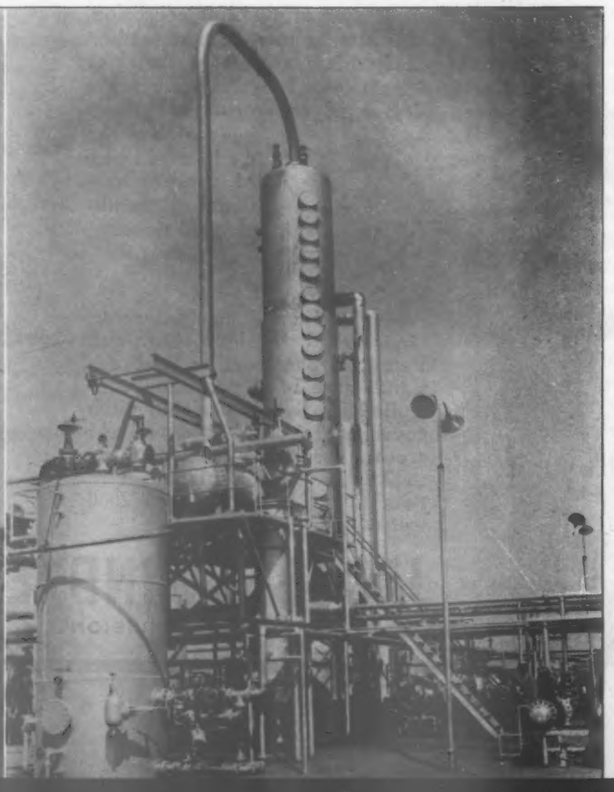
Avoids Transportation Delays

The distance from American supply houses and the long delays expected from ocean transportation and customs regulations have forced the company to establish and maintain adequate repair shops and factories. At the present time no job is too small or too large for the factory department which contains locomotive, boiler, welding, blacksmith, bit, pipe and various other shops besides a huge machine shop housing 50 assorted machines and lathes. One example of the versatility of the factory department was the installation of a 2-ton clamp on a broken 16-in. crankshaft of a diesel-powered British tanker which made possible a loaded return voyage.

The storehouses too, are different, in that enormous inventories have to be carried. Lacking the specialty supply houses common in the United States the "Bodegas" stock spare parts and material of all kinds in quantities calculated to last from 3 to 6 months. The enormity of this task can be fully understood when one realizes that essential parts have to be stocked for the most modern of drilling equipment, as well as machinery of all kinds dating back 20 years or more



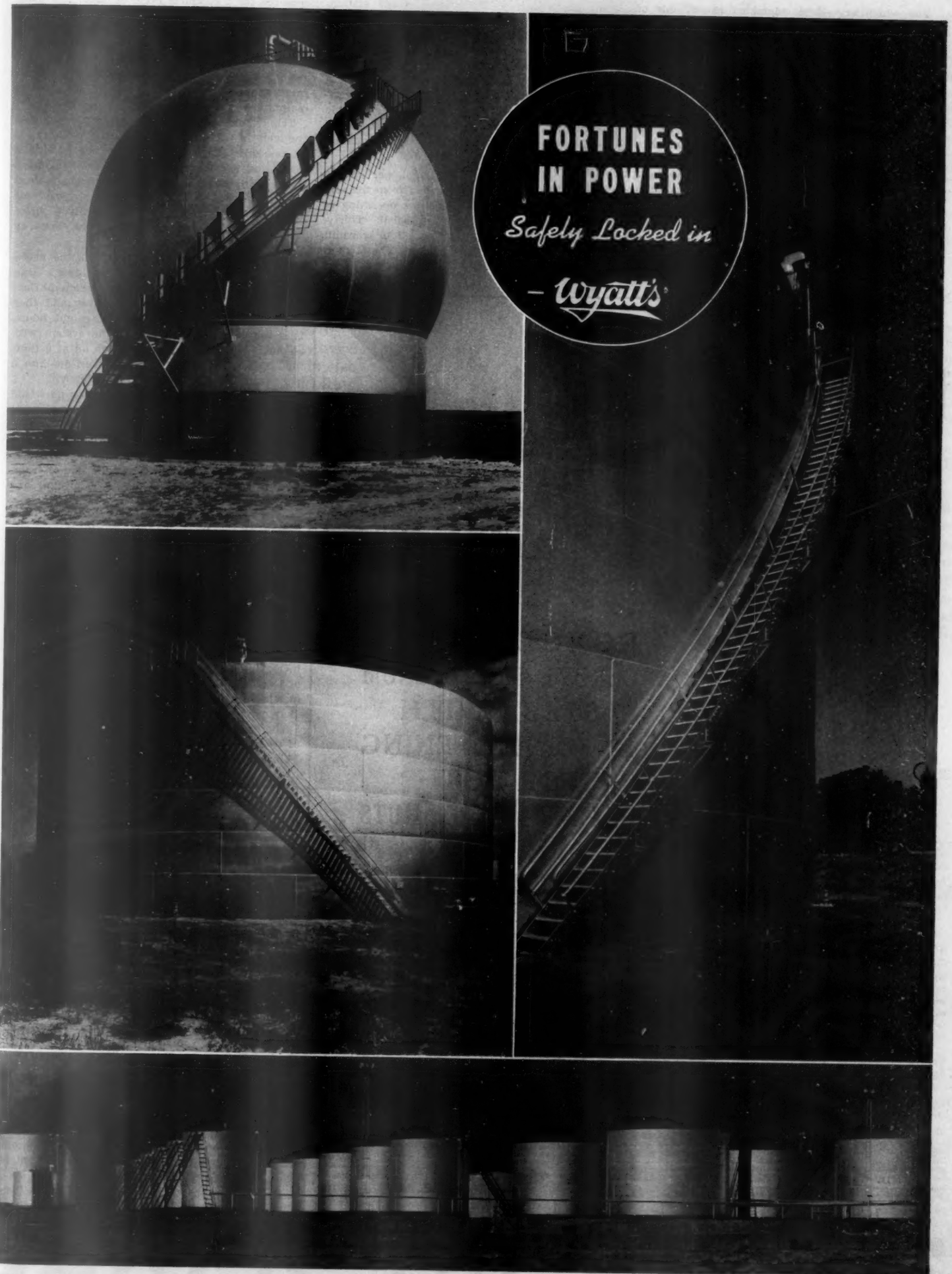




Above: One of the compressor plants, showing gas cooler arrangement and remote absorber

Extreme left: The stabilization towers with building housing feed and reflux pumps and instrument panels

Left: A view of the distillation unit of the central plant. At present a total of 650,000 gal. per day of 42-gravity absorption oil is pumped from the central plant to nine remote absorbers operating at pressures varying from 40 to 300 lb.


FORTUNES
IN POWER
Safely Locked in
– Wyatt's

and which may have originated in any one of six different countries.

Although drilling and production operations are up to date in every respect with efficient methods and interesting innovations peculiar to local conditions continually being applied, the gasoline plants attract the most attention from visitors to the field. This is no doubt due to their concentration of equipment, orderly appearance and the business-like noises of numerous engine exhausts.

However, the "gas plants" as they are called, may have a just claim to especial interest as they are unique in a number of ways. At the present time there are six natural-gas plants in the field with a total raw-gas handling capacity of 50,000,000 cu. ft. per day. Five of these are of the remote absorption and compression type—compressor stations with absorbers only—and one central plant embodying a 12-unit compressor station, large distillation unit, two-tower stabilizer unit and a gas engine-driven electric-generating plant.

This centralization of distillation equipment is a recent economical move, as only slightly more than a year ago there were distillation units in operation at three separate plants. The discontinuance of two of these was made possible through higher pressure absorption with its attendant reduction in absorption-oil circulation necessary.

At present a total of 650,000 gal. per day of 42-gravity absorption oil is pumped from the central plant to nine remote absorbers operating at pressures varying from 40 lb. to 300 lb. Thirty-five miles of pipe line are required to transmit the oil to and from the central plant. The farthermost plant is about 7 miles distant and 4 days are required for a complete cycle of oil to this plant and back.

Under such conditions it is impossible to gage the exact daily plant yields as the gas load varies from day to day. Yields are calculated monthly from average fractional analyses of the plant's intakes and residues. A well-staffed laboratory is maintained and operations are closely checked.

Triplex plunger pumps are used for pumping the lean oil which leaves the central plant at 410 lb. pressure. Each outgoing line has an orifice meter and needle valve leaving a common manifold and the flow to the various plants is carefully regulated. This is made easier by carrying a slightly higher pressure than actually required on the pump discharge and popping the excess oil back into the vent tank.

One feature of this arrangement is the necessity of having unusually large vent tanks. During the warmer hours of the day the rich oil lines tend to surge and empty themselves and then must be refilled during the cooler night hours. It is not uncommon to charge the system with as much as 5,000 gal. of absorption oil at a time, then to have the lean oil tank overflow into a larger storage tank several hours later.

Ordinarily, heavy losses of absorption oil would be expected through transmission-line breaks, but this is not the case in northern Peru where the atmospheric temperature does not vary more than 20° throughout the year and expansion and contraction of pipe lines is very small. The oil-transmission lines are all welded aboveground and laid straight with the hills and hollows taking care of pipe movements.

The raw gasoline produced is 45-lb. Reed vapor pressure and is stabilized at the central plant to whichever vapor-pressure product is currently required by the refinery. This ranges from 12 to 26 lb. vapor pressure. The finished product is pumped a distance of only 6 miles to the refinery located at the port of Talara.

Another product of the central plant is commercial propane which is bottled and shipped in increasing quantities to Lima, the capital of Peru, and other large towns down the coast, where domestic fuel has heretofore consisted mostly of charcoal and electricity.

The gathering system for all the plants consists of 65 miles of pipe varying in size from 2-in. to 14-in. in diameter and the trunk lines are interconnected in such a manner that should an overload or shutdown occur at any one plant the other plants help to maintain a vacuum in that particular district. The fuel pipe-line system consists of more than 100 miles of pipe, and gas can be supplied from any one of the six plants. These two pipe-line sytems, unlike the oil and water transmission lines which constitute a department in themselves, are under the supervision of the gasoline department.

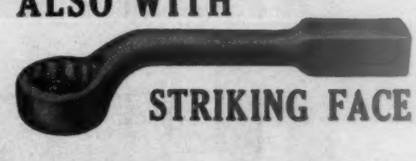
Also within the gasoline department is the water station. Since the International Petroleum Co.'s concession is located on territory that can be described only as desert land, the water needed for its industrial operations as well as its domestic consumers frequently presents a problem of grave concern to its engineers. A lime-soda-ash treating plant is located near the mouth of the Chira River, approximately 15 miles down the coast from the Parinas Point light. From this plant comes 1,350,000 gal. of excellent water to the field and refinery daily. The difficulties of the water supply are due to the varying stages of the river which have been known to change from flood stage to a dry river bed overnight. After high water the river often forms a new channel, leaving the old channel dry, and pumps and pipe lines or canals have to be rushed to the new stream.

As in other oil fields all over the world the production of crude oil and natural gasoline in Peru presents its particular problems and difficulties, but with the one important advantage of an ideal climate.

FORGED FROM CHROME-MOLYBDENUM STEEL WITH 12-POINT OPENING FOR BOTH HEX AND SQUARE NUTS

This new Williams' "Superrench" retains the general characteristics and dimensions of the popular "Structural" pattern but provides a Box Head instead of the conventional Open Head. Its 12-point opening insures a positive and slip-proof grip on both Hex and Square nuts—the *safest* wrench design possible. The handle has generous offset for maximum clearance and the usual tapered end for "lining-up." Furnished in 7 sizes for U. S. Standard Nuts, 7/8" to 1-5/8". Drop-forged from tough, chrome-molybdenum steel, heat-treated and finished in gray, baked enamel.

ALSO WITH STRIKING FACE



Adapted for heavy work in close quarters—for setting up large nuts and loosening "frozen" ones. Chrome-molybdenum steel, specially heat-treated to withstand shock loads. Finished in gray, baked enamel.

Write for literature or see our advertisement in the Composite Catalog. Buy from your Supply Store.

J. H. WILLIAMS & CO. HEADQUARTERS FOR 225 LAFAYETTE ST., NEW YORK

Efficient applications for the Baker Wall Scraper include: Setting Liners; Setting Cement Plugs; Bottlenecking for Cementing Purposes; Enlarging Holes for Casing; Enlarging Holes for Gravel Packing; Straightening Holes; Fishing Jobs; Water Shut-Off Tests; Removing Sections of Drillable Pipe . . . AND Taking Cores from Side Walls of a Previously Drilled Hole by Substituting Sampler Blades for the Regular Scraper Blades. This converts the Wall Scraper into a Baker Wall Sampler which is described below.

BAKER ROTARY WALL SAMPLER

With this device (See Fig. 9) it is possible to take actual cores from the side walls of any uncased hole at any depth and thus open up new opportunities for restoring lost core records, or for checking formations which were not cored when drilled through. It also provides a positive means of checking interesting zones brought out by electrical coring methods.

DOUBLE-VALUE FOR YOUR MONEY

The Baker Wall Sampler consists essentially of a Baker Wall Scraper Assembly except that a special set of Wall Sampler Blades, containing core taking tubes, are used in place of the normal cutting blades of the Wall Scraper. Thus, the Wall Scraper and Wall Sampler are really "Two-Tools-in-One," a combination that means double-value for your money.

South American Representatives:

Mr. J. Sanchez
320 Defensa
Buenos Aires
Argentina, S. A.

Mr. S. B. Schnitter
No. 4 Mary Street
Port of Spain
Trinidad, B. W. I.

BAKER OIL TOOLS, INC.
Huntington Park, Calif. - Houston, Texas

FOR COMPLETE INFORMATION ON THE BAKER ROTARY WALL SCRAPER AND WALL SAMPLER REFER TO OR SEND FOR THE FOLLOWING:

★ Baker Section of the 1940 Composite Catalog, containing 56 pages of informative text matter and illustrations covering the entire Baker Line of Equipment.

★ Individual 1940 Baker Catalog (a reprint of the Baker Section in the Composite Catalog).

★ Baker Sections in the 1939-1940 Drilling Equipment Directory.

★ Baker Broadcast No. 19, giving complete information covering the many practical applications for the Baker Wall Scraper and Baker Wall Sampler. It contains 40 pages of detailed information and illustrations and should be in your reference file.

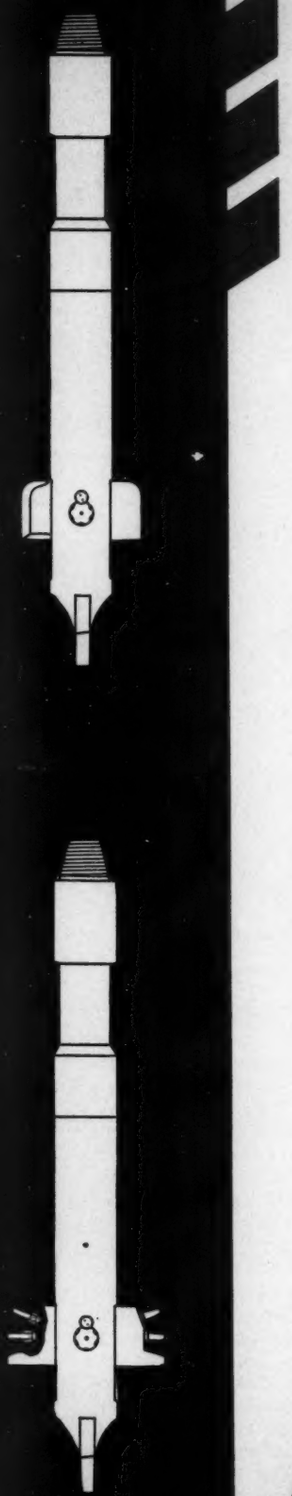
PARA DETALLES COMPLETOS SOBRE EL ENSANCHADOR/SACA-TESTIGOS DE PARED "BAKER", VEASE (SOLICITESE CASO NECESARIO) LAS SIGUIENTES PUBLICATIONES:

★ Sección "Baker" del "Composite Catalog" (Edición 1940), que consta de 56 páginas de materia informativa é ilustraciones, abarcando la línea completa de Productos "Baker".

★ Catálogo "Baker" de 1940 (una reproducción de la Sección "Baker" del "Composite Catalog").

★ Secciones "Baker" del "Drilling Equipment Directory" (Edición 1939/1940).

★ Folleto "Baker" No. 19, conteniendo información completa acerca de las muchas aplicaciones prácticas del Ensanchador/Sacatestigos de Pared "Baker". Consta de 40 páginas de información detallada é ilustraciones. Opinamos que debe figurar en su archivo de consulta.



Sus características salientes son: Resistencia y una Sorprendente Capacidad de Ensanche.

He aquí algunas de las aplicaciones eficaces del Ensanchador 'Rotary' "Baker": Colocación de Cañerías "Perdidas"; Colocación de Tapones de Cemento; Asientos para Cementación; Ensanchamiento de Pozos para colocar Cañería de Entubación; como igualmente para "Gravel Packing"; Rectificación de Pozos; Trabajos de Pesca; Comprobación de Aislamientos de Agua; Eliminación de Secciones de Cañería Perforable; y Extracción de Testigos de las PAREDES de POZOS YA PERFORADOS, mediante la substitución de las aletas ensanchadoras por otras especiales, saca-testigos. Este cambio convierte al Ensanchador "Baker" en un Sacatestigos de Pared cuya descripción figura en el párrafo que sigue.

SACA-TESTIGOS DE PARED "BAKER"

Con esta herramienta (Véase Fig. 9) se puede obtener testigos en un punto cualquiera de las paredes de cualquier pozo sin entubar. Ello constituye un nuevo medio de restablecer registros desaparecidos de testigos, ó de comprobar "formaciones" de las que no se obtuvo testigos al tiempo de ser perforadas. Igualmente sirve la herramienta para verificar, en forma efectiva, zonas interesantes que se hayan descubierto empleando métodos eléctricos.

El Saca-testigos de Pared "Baker" se compone de un Ensanchador 'Rotary' "Baker" *sin* las Aletas Cortantes de éste, las cuales van reemplazadas por otras especiales, provistas de TUBOS SACA-TESTIGOS DE PARED. De consiguiente, el Ensanchador y el Saca-testigos de Pared son en realidad UNA sola herramienta que presta el servicio de DOS.

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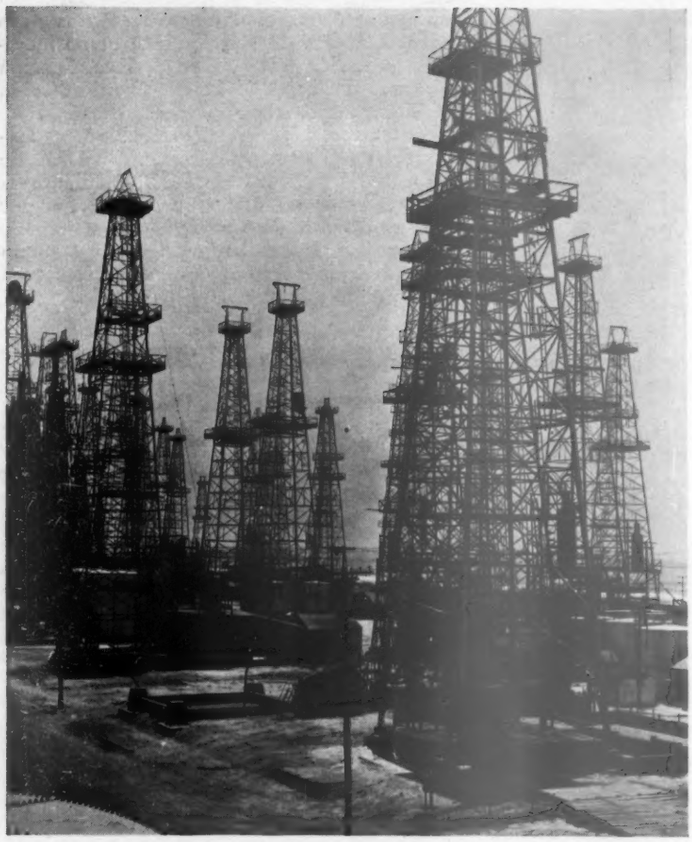
BAKER OIL TOOLS

Steady Adva

Continuo Prog



Close spacing may be justified in this Long Beach section of California's Wilmington field, since oil sand apparently extends out under the Pacific for several miles

La estrecha separación puede justificarse en esta sección de Long Beach del campo Wilmington de California, a causa de que la arena petrolífera se extiende aparentemente por varias millas debajo del Pacífico

EVEN in areas where competitive drilling and unrestricted production are still to be found, there is a regard for problems of the future, as well as for those of the present. In little more than one decade, the oil boom, with its waste and industrial confusion, has been replaced; and great strides have been made toward what appears to be the industry's ultimate goal: planned, orderly operation, with fair profits contingent not upon high price but upon efficient accomplishment.

At this time, when there is discussion of oil-industry control by various governmental groups, it is well to recall the progress of the last 10 years, and especially of the last 12 months; for herein must finally rest the case for present type of management. Could so many improvements have been made and adopted under any other form of management?

COOPERATION

Late years have disclosed with undeniable force the need for cooperation among operators of each pool. When a group of concerns takes oil and gas from the same reservoir, it is only through mutual agreement that they can eliminate waste and prolong the life of the pool. Early examples of unit operation often showed questionable results, because some operators remained outside of the cooperative agreement. More recently there have been a number of cases where pools have been developed and operated with all leaseholding concerns in accord. In these cases a burden of evidence is being accumulated that will do much toward bringing about future cooperation.

Unit operation has often been recommended as the best possible management of pools in which interest is divided among a number of concerns. Under this arrangement all interested parties combine their leases to form a common block, and each receives an interest in the block commensurate with his former interest. A company is formed to develop and exploit the block; or one of the interested concerns is designated as the operating company.

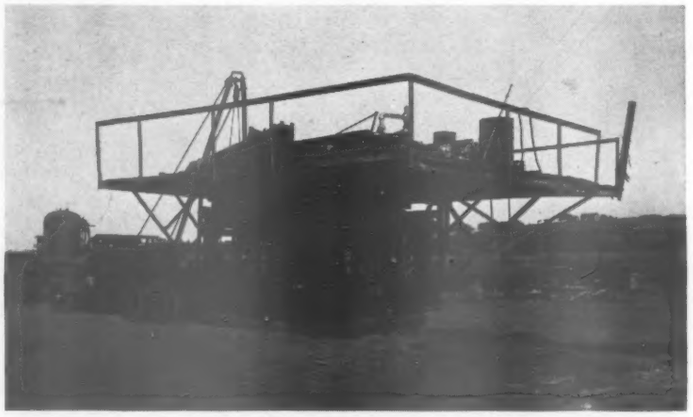
While unit operation is ideal in many respects, it usually calls for much valuation work, bookkeeping, give-and-take agreement, and mutual trust of the parties concerned. Then there is the possibility that such an agreement may later lead to disputes and lawsuits among the members of the group, as has been the case in regard to the Kettleman North Dome Association. Since unit operation often calls for more congruity of opinion than is usually found in

HASTA en las regiones en que todavía continúan la perforación competidora y la producción desenfrenada, se está dando atención a los problemas del futuro, lo mismo que a los del presente. En poco más de una década, el auge en petróleo, con su derroche y confusión industrial, ha sido abatido, y grandes pasos se han dado hacia lo que se vislumbra como la meta de la industria: la explotación racional, debidamente coordinada, con ganancias lícitas dependientes nó de precio alto, sino de la eficacia de los resultados.

En estos momentos en que la dirección de la industria petrolera es tema de discusión entre varios departamentos del gobierno nacional, bueno es recordar el progreso de estos últimos diez años, y muy en particular, el de estos últimos doce meses, pues se hallará en este progreso la solución final del problema del presente tipo de administración. ¿Podrían tantos adelantos haberse formulado y adoptado bajo cualquiera otra forma de administración?

COOPERACION

Estos últimos años han revelado, de una manera convincente, la necesidad de cooperación entre los explotadores en cada concesión. Cuando un grupo de firmas extrae petróleo y gas de un mismo yacimiento, se impone la necesidad de un acuerdo mutuo para evitar el derroche y prolongar la duración de la explotación.



Two trucks moved this substructure, engine and platform ½ mile to a new location in a Gulf Coast field

Dos camiones se aprovecharon para el transporte de esta subestructura, motor y plataforma, a media milla, a una nueva ubicación en un campo en la Costa del Golfo

Pumping-unit foundations and drilling-derrick corners are sometimes poured at the same time

Los cimientos para el grupo de bomba y las esquinas para la torre de perforación se hacen, a veces, al mismo tiempo

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human relationship, a system of cooperative agreement is often adopted in its place.

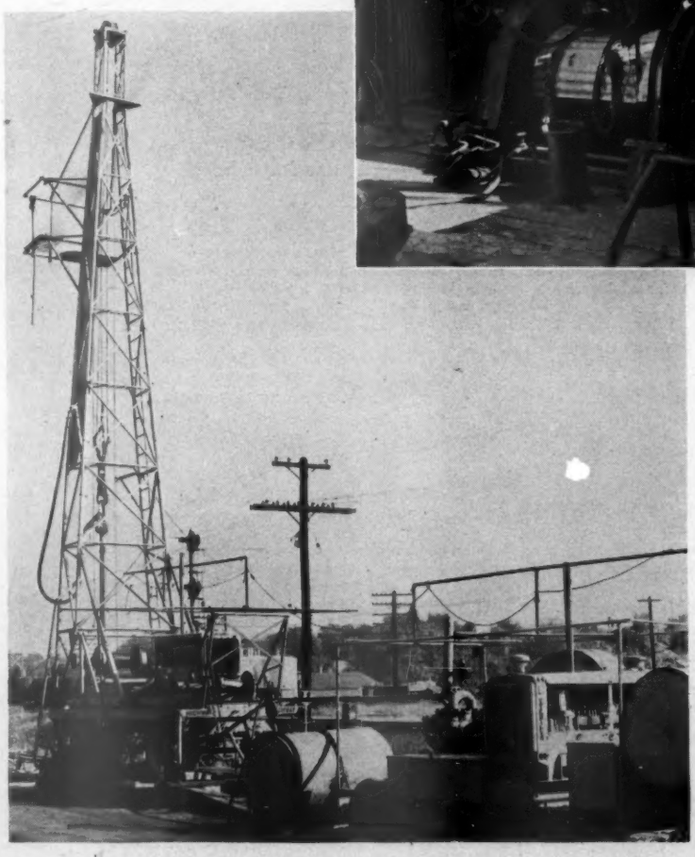
Through cooperative agreement each concern retains control and operation of its properties; but such matters as well spacing, drilling program, producing methods, and secondary recovery are regulated by agreement. The understanding usually provides for a free exchange of well records.

Since cooperative agreement can accomplish many of the desirable features of unit operation, it is expected to play an increasingly conspicuous part in the development and producing of future pools. In fact, most present-day pools are operated under some degree of cooperative agreement; but this usually is not extensive enough to regulate such matters as the drilling program or an organized pressure-maintenance program. Pressure maintenance and repressuring usually require a high degree of cooperation if efficiency is to be had. Present indications are that unit operation is the best system of management where a secondary recovery method is to be employed.

In cases where the entire pool is under lease by one company, unit operation usually is carried to the

A standby hoist driven by purchased power was used on the steam rig that drilled the world's deepest well, thereby providing two independent hoisting systems

Un montacarga auxiliar, accionado por fuerza comprada, se empleó en el aparejo de vapor, que perforó el pozo más profundo del mundo, estableciéndose así dos sistemas independientes de levantamiento



A portable slim-hole drilling rig in Illinois, where drilling is comparatively shallow and moves are frequent

Un aparejo de perforación de agujero angosto, de tipo portátil, en Illinois, donde la perforación se hace a poca profundidad relativa y los movimientos se repiten con frecuencia

Los primeros ejemplos de explotación, sobre base cooperativa, mostraron resultados dudosos, a causa de que algunos interesados no entraron a formar parte del acuerdo cooperativo. En estos últimos años, sin embargo, se han presentado numerosos casos en que las concesiones han sido desarrolladas y explotadas por todas las empresas con derechos a la explotación, trababajando todas de común acuerdo sobre base cooperativa. En semejantes casos, la acumulación de evidencia hará mucho por introducir futura cooperación en toda la industria.

La explotación unitaria ha sido, a menudo, recomendada, como la mejor administración posible de concesiones en que el interes está dividido entre varias empresas. En virtud de este arreglo, todas las empresas interesadas combinan sus derechos de concesión, formando un solo grupo, y cada una recibe su parte de acuerdo con la importancia de su aporte. Se forma así una compañía para desarrollar y explotar el grupo, o bien, una de las firmas interesadas del grupo queda designada para hacerlo.

En varios sentidos, la explotación unitaria es ideal, pero al mismo tiempo implica mucho trabajo de avaluación, contabilidad, acuerdos muy elásticos y recíproca confianza entre los interesados que laconstituyen. Luego se presenta también la posibilidad de que los acuerdos o convenios firmados se presten, más tarde a serias disputas y costosos juicios entre los miembros del grupo, como ha sucedido en el caso, tan conocido, de la Kettleman North Dome Association. La explotación, bajo la forma unitaria o cooperativa, exige, en realidad, más armonía de opinión, que la ordinaria en las relaciones humanas, y por esta razón se adopta, a menudo, un convenio cooperativo.

Mediante el acuerdo o convenio cooperativo, cada empresa retiene gobierno sobre la dirección y explotación de su propiedad; pero, al tratarse de asuntos como la separación de pozos, programa de perforación o sondeaje, métodos de producción y recuperación secundaria, todas estas importantes actividades se regulan por convenio. En semejantes convenios se incluye, ordinariamente, el libre intercambio de información sobre los pozos.

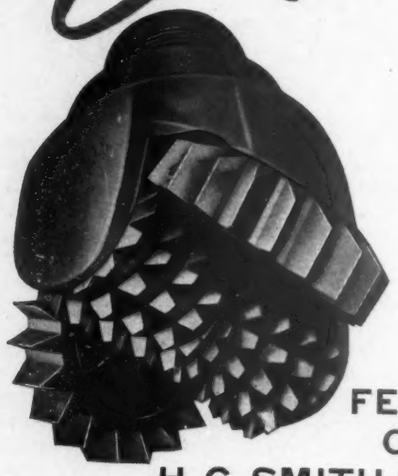
Como el acuerdo o convenio cooperativo puede realizar muchas de las ventajas más apetecibles de la explotación unitaria, se espera que desempeñará un papel de creciente importancia en el desarrollo y la explotación de las concesiones futuras. En efecto, casi todas las concesiones actuales se explotan bajo cierto grado de convenio cooperativo, pero no es, por lo general, bastante extenso para regular actividades importantes, como por ejemplo, el programa de perforación o un programa organizado para la conservación de presión. La conservación o mantenimiento de presión y la presión suplementaria, requieren, por lo general, un alto grado de cooperación, para asegurar buen rendimiento. Las indicaciones presentes dan a entender que la explotación unitaria es el mejor sistema de administración al tratarse de la aplicaciñon de un método de recuperación secundario.

En los casos en que el yacimiento completo está a cargo de una sola empresa, la explotación unitaria se desarrolla entonces hasta su más elevado grado de perfección. El plan unitario queda en efecto durante toda la vida del yacimiento y no hay necesidad de alteraciones o cambios, debido a diferencias de opinión. Algunos de los yacimientos descubiertos más recientemente en California se comprenden en esta de explotación. También hay varios en Texas y otros estados del país. Estos ejemplos a menudo indican lo que deben ser los fines en la organización de un plan unitario o de un acuerdo cooperativo.

Dependability

H.C.SMITH

DRILLING TOOLS



Hard Formation Cutter Head

Soft Formation Cutter Head

H. C. Smith T-39 Wire Line Core Drill

FEATURES OF THE H. C. SMITH ROCK BIT

1. Triple bearing construction of the gauge cutters eliminates side play of cutters and insures full gauge of hole.
2. Rugged body and superior design cross cutter bearing construction permits high rotational speed and heavy loads—when desirable.
3. Cutter assemblies designed to utilize the maximum cutting surfaces of all individual cutters.
4. More circulation provided through large slush tubes on side cutter and fan-tail circulation along cross cutters prevents "balling" of bit. Large openings around cutters permits quicker displacement of cuttings from bottom of hole.
5. H. C. Smith Rock Bits cut straight holes because the concave construction of the cross cutters allows a cone to form in the center of the hole which acts as a centering guide for the bit.

1. La construcción de triple cojinete de las fresas de calibre suprime el juego lateral de los cortadores y asegura un agujero de diámetro completo.
2. El firma cuerpo y la construcción de excelente tipo, de los cojinetes del cortador transversal, permiten altas velocidades de rotación y grandes cargas, cuando esto sea conveniente.
3. Los juegos o grupos de fresas están proyectados para utilizar las superficies cortantes máximas de todas las fresas individuales.
4. Hay mayor circulación por los grades tubos de lodo en la fresa lateral y circulación en forma de abanico por las fresas transversales, lo cual evita la retardación de la barrena. Los orificios grandes alrededor de las fresas permiten más rápido desplazamiento de las partículas del fondo del agujero.
5. Las barrenas H. C. Smith para rocas cortan agujeros rectos, a causa de que la construcción cóncava de las fresas transversales permiten la formación de un cono en el centro del agujero, el cual actúa como una guía de centración para la barrena.

FEATURES OF THE H. C. SMITH T-39 WIRE LINE CORE DRILL

1. Simple and positive locking of inner barrel while coring and retrieving of barrel after coring operation is completed.
2. Improved bearings in cutters which allows longer hours on bottom without loss of hole gauge.
3. Heavier pins and body construction for increased safety.
4. Improved double core catcher.
5. Floating inner barrel.
6. Hard and soft formation cutter heads are interchangeable on core drill.

1. Cierre sencillo y positivo del cilindro interior, mientras se está cortando el núcleo de muestra y recuperando el cilindro, después de terminado el trabajo de sacar núcleos.
2. Cojinetes perfeccionados en las fresas, lo cual permite más horas de trabajo al fondo sin que se pierda el diámetro del agujero.
3. Pasadores y cuerpo de construcción más pesada, para mayor seguridad.
4. Perfeccionado asegurador de doble núcleo.
5. Cilindro interior flotante.
6. Las cabezas de barrena para formaciones blandas y duras son intercambiables en la sonda sacanúcleos.

Foreign Operators: DULL CUTTERS ON H. C. SMITH ROCK BITS CAN NOW BE REPLACED WITH NEW CUTTER ASSEMBLIES IN YOUR OWN SHOPS AT A SUBSTANTIAL SAVING

Empresas en el Extranjero: LAS FRESAS SIN FILO DE LAS BARRENAS H. C. SMITH PARA ROCA PUEDEN AHORA REEMPLAZARSE CON NUEVOS GRUPOS DE FRESAS EN SUS PROPIOS TALLERES, CON UNA CONSIDERABLE ECONOMIA DE GASTOS.

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greatest degree of perfection. The unit is in effect throughout the life of the pool; and no compromises are necessary due to differences of opinion. Some of the more recently discovered pools of California fall in this class, and also many in Texas and in other states. These often indicate what the aims should be in organizing a unit plan or a cooperative agreement.

WELL SPACING

A study made in Kansas fields by Eugene A. Stephenson* showed that fields having between 15 and 21 acres per well produced at least 50 per cent more oil per acre than close-spaced fields. Because of insufficient data on sand thicknesses, the results could not be considered conclusive. However, the evidence was believed sufficient to prove that no benefits have been gained through close spacing. Mr. Stephenson lists three reasons why many operators have favored well spacing of 10-acre units or closer:

1. It has been the established practice. The 10-acre spacing system is convenient under most systems of land division, and is, therefore, followed, although it is based on no engineering considerations.

2. It has been believed quite generally that closer spacing would mean greater recovery from the reservoir. This is disproved by Mr. Stephenson's work, at least for the fields of Kansas.

3. When proration is based on potential, or on number of wells rather than on acreage, closer spacing means higher lease allowables. It is unfortunate that all attempts to adjust the flow of oil to market demand should start after the well has been completed. Wider spacing would retard the rate of production, thereby prolonging the life of the pool, reducing the need for proration, and offering a more rapid return on the capital invested for each well.

It is estimated by Mr. Stephenson that the annual cost of drilling unnecessarily close-spaced wells is quite close to $100,000,000 per year. This sum, spent on secondary-recovery methods, would yield very worthwhile returns.

Wide spacing has made considerable progress in many areas; and this factor alone has been effective in avoiding some of the most disturbing features of the oil boom. Twenty-acre spacing is now the accepted practice in the more recently discovered fields of California's San Joaquin Valley. With closer spacing in these fields, overproduction, a serious problem now, would have become infinitely more serious and the state's future supply of petroleum would have been jeopardized unnecessarily.

ORGANIZED DRILLING

In unitized pools, or in pools controlled by a single company, drilling campaigns have become highly organized and economies have been introduced that were unknown and impossible under the former competitive practices. Large blocks are now drilled up with comparatively few drilling rigs. These are kept constantly busy, and the order of drilling is planned so that each move is as short as possible. While a rig is completing one well, the next location is prepared. Pits and cellar are dug, derrick is erected, and supplies are placed at the location so that only a matter of hours elapses during the move while the rig is not engaged in actual drilling service.

The importance of reducing moving time and moving expenses has been fully realized. In areas that are level enough to permit skidding the derrick, much of the drilling machinery is left in place while the

(Continued on Page 197)

*"Some Consequences of Close Spacing in Kansas," presented before A.P.I., May 1938.

Diesels were used on a deep test in Alaska for driving pumps and rotary table, while the hoist was operated by steam

Se emplearon motores diésel, en un pozo profundo de ensayo, en Alaska, para accionar las bombas y la rotativa, mientras el montacarga fué accionado por vapor

DISCANCIA ENTRE LOS POZOS

Un estudio emprendido en los campos de Kansas, por Eugene A. Stephenson,* mostró que los yacimientos en que hay de 15 a 21 acres entre cada pozo en producción, han producido, por lo menos, como 50% más petróleo por acre, que aquellos en que los pozos quedan a menores distancias entre sí. A causa de insuficientes datos sobre el espesor de la arena, no se pudieron considerar conclusivos los resultados. Sin embargo, la evidencia se tuvo por suficiente para mostrar que no se han obtenido beneficios mediante distancias menores. El Sr. Stephenson indica tres razones por las cuales muchos explotadores han favorecido una distancia de 10 acres o menos entre los pozos:

1. Esta distancia ha sido una práctica establecida. El sistema de distancia de 10 acres es conveniente bajo la mayor parte de los sistemás de división de terreno, y es, por lo tanto, seguido, a pesar de que no se basa sobre ninguna consideración técnica.

2. Se ha creido generalmente que la menor distancia o separación significa mayor rendimiento del yacimiento. Esto ha sido refutado por el estudio del Sr. Stephenson, por lo menos, en lo que atañe a los campos de Kansas.

3. Cuando la restricción oficial se basa sobre el potencial, es decir, sobre el número de pozos, en lugar del número de acres, la menor distancia significa un mayor número de arrendamientos permitidos. Es lástima que todos los atentados a ajustar el abastecimiento de petróleo a la demanda del mercado tengan que empezar después de completado el pozo. La mayor distancia retardaría el régimen de producción, y de esto resultaría prolongación de la duración del yacimiento, moderación de la necesidad de restricciones oficiales y la posibilidad de más rápida ganancia sobre el capital invertido en cada pozo.

El Sr. Stephenson calcula que el costo anual de la perforación de pozos innecesariamente cercanos es bien alrededor de $100.000.000. Esta suma, invertida en métodos de recuperación o rendimiento secundario, produciría beneficios muy satisfactorios.

La amplia distancia entre los pozos ha ha progresado mucho en diversas regiones, y este factor solo ha sido efectivo en evitar algunas de las desventajas más contraproducentes del auge en la industria petrolera. La distancia de veinte acres es ahora la práctica aceptada en los campos de más reciente descubrimiento en el Valle de San Joaquín de California. Con una menor distancia o separación, en estos campos, la producción excesiva, que es hoy en día, un serio problema, habría sido úno de más graves consecuencias, y el futuro abastecimiento de petróleo del estado habría también quedado enfrentando innecesariamente una dislocación incalculable.

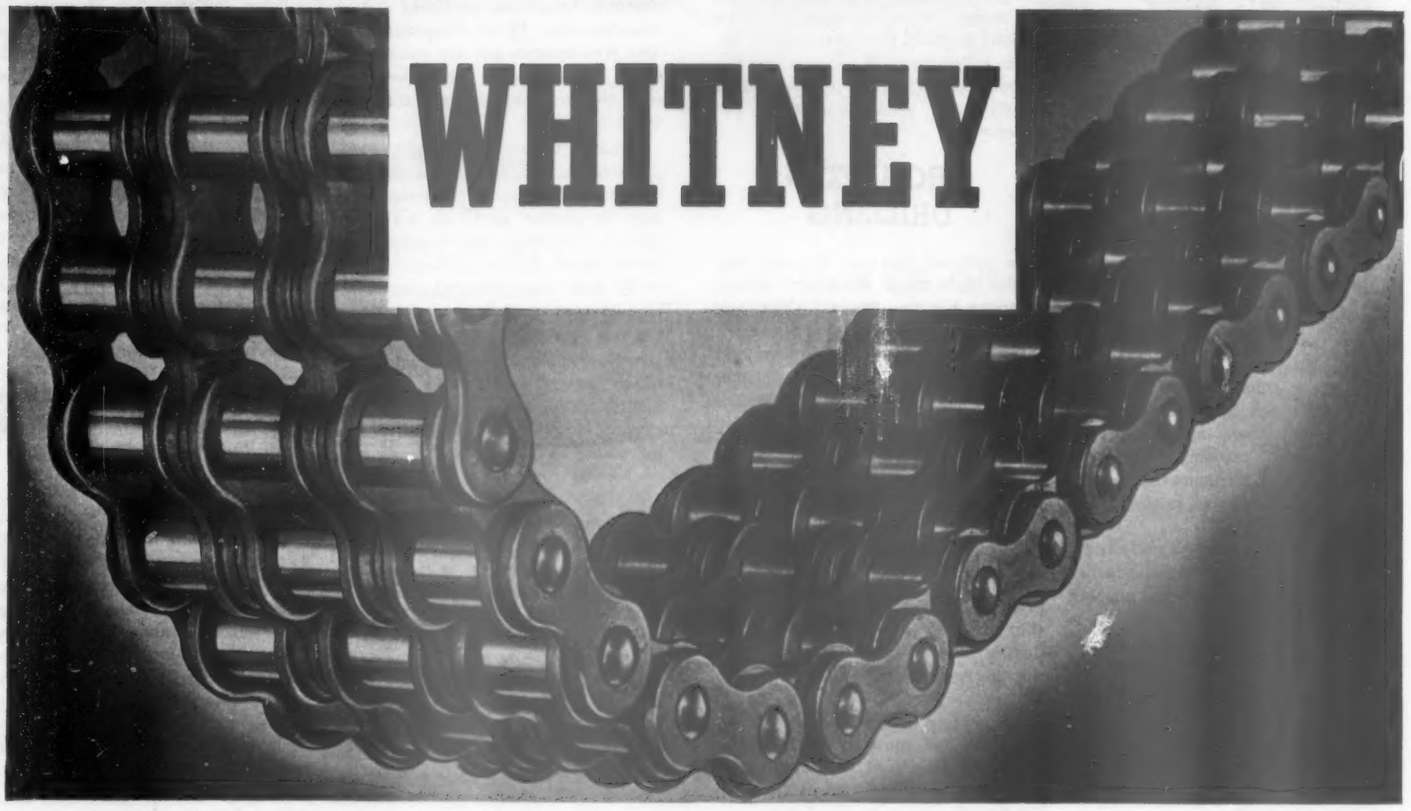
*"Algunas Consecuencias de la Poca Distancia en Kansas" estudio presentado ante la A.P.I. en mayo de 1938.

PERFORACION ORGANIZADA

En los yacimientos explotados por grupos, o en los explotados por una sola empresa, los programas de perforación se presentan ahora muy bien organizados, y se han introducido economías que antes era desconocidas e imposibles bajo las anteriores prácticas de competencia. Extensas concesiones se sondean ahora con la ayuda de un número comparativamente pequeño de torres. Todos los equipos de perforación se mantienen continuamente ocupados, y el plan se trabajo se proyecta de modo que cada movimiento sea lo más corto posible. Mientras un aparejo está completando un pozo, se prepara la siguiente ubricación. Se excavan los hoyos y sótano, se instala la torre de perforación y se colocan los abastecimientos en el punto del trabajo, de modo que trascurren sólo unas pocas horas durante el movimiento, mientras el aparejo no está ocupado el activo servicio de perforación.

La importancia de reducir el tiempo de movimiento y los gastos de movimiento ha sido completamente comprendida. En las regiones bastante lisas para permitir el arrastre de la torre de perforación, gran parte de la maquinaria de perforación queda en su puesto, mientras la torre se traslada a otro sitio. Un caso típico es el campo de Ten Section, explotado por la Shell Oil Co., Inc., en el Valle de San Joaquín. Aquí, un peso de como 100.000 libras, que incluye la torre y el equipo de perforación, ha sido movido en un solo grupo. Los caballetes portapoleas se quitan durante el arrastre, para aliviar la tensión sobre la torre, pero el malacate o aparejo de maniobras, plataforma de la rotatoria y motor propulsor de la rotatoria, instalado debajo del piso, se dejan en sus sitios, sin tocar, en muchos casos. Las bases o cimientos para las torres de perforación, en este campo, han sufrido un cambio completo. En los primeros puntos perforados, se usaban pilas esquinadas de hormigón, pero actualmente no se emplea ningún hormigón en las esquinas, En lugar de esquinas de hormigón, un pesado bastidor de acero forma la base para la torre. Este bastidor queda en su sitio, mientras se mueve la torre, y en la nueva ubicación se coloca sobre sostenes, que dan soporte a cada esquina, hechos de madera vieja de 6 u 8 pulgadas. El emparrillado se hace de vigas en doble T y lleva miembros transversales para soportar la base inferior de la plataforma de la rotatoria, el motor propulsor de la rotatoria, in-

(Continue en Pagina 197)



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derrick is moved to a new location. Such is the case in the Ten Section field, operated by Shell Oil Co., Inc., in the San Joaquin Valley. Here a weight of about 100,000 lb., comprising derrick and drilling equipment, has been moved as a unit. Crown blocks are removed during the skidding to relieve strain on the derrick, but the draw works, rotary table, and underfloor rotary-drive engine are sometimes left in place. Derrick foundations in this field have undergone a complete change. Concrete corner piers were used at the first locations drilled, but now no concrete whatsoever is used under the corners. Instead of concrete corners, a heavy steel framework forms the foundation for the derrick. This framework, or grillage, is left in place while the derrick is moved, and at the location it is placed on timber mats which support each corner and are made up of old 6-in. or 8-in. timbers. The grillage is made up of I-beams and has cross members to support the rotary-table subbase, the underfloor rotary-drive engine, the auxiliary hoist and the derrick floor. The derrick floor is elevated the desired height above the grillage base through the use of extended legs on the derrick. These bolt into the grillage 8 ft. below the floor level.

In most cases concrete is used under derrick corners, as this is considered necessary when heavy loads are to be handled in areas where the ground becomes soft in wet weather. There has been a widespread acceptance of steel substructures for derricks. These are bolted to concrete foundations and serve to replace the type of concrete corner block that projects high above the ground level. Usually steel substructures are used only under the drilling derricks. The drilling derrick is later replaced by a production derrick, and the legs of the small derrick are bolted directly to the concrete derrick floor.

PUMPING FOUNDATIONS

Unusually well-planned development procedure can be witnessed on large blocks of leases held by Shell Oil Co., Inc., in the Round Mountain and Mountain View fields of the San Joaquin Valley. Here wells are all completed as pumpers, and one of the advanced practices calls for pouring all concrete to be used during the life of the well before a foot of hole is drilled. Pumping equipment is selected by company standards long before drilling is commenced.

When the cement mixer is moved in to pour concrete for the derrick foundations and cellar walls, the foundation for the pumping unit is also poured. The derrick floor is paved at this time and an additional slab is laid beside the derrick to accommodate the well-servicing truck during rod and tubing jobs. Heavy concrete blocks, poured beneath the slab, serve as holddown anchors for the truck. Since so much preparation is made toward installation of pumping equipment before the drilling starts, it usually requires only 12 days to drill the well and to put it on production.

In rough or muddy country it has been found that much moving time can be saved by constructing adequate roads to each location. In many parts of the country such construction work is considered too expensive to be practical; but, in an increasing number of instances, the first activity after staking out a new location consists in putting in an all-weather oiled road to the drilling site. In some cases impressive figures can be shown to establish the saving of time and of wear and tear on transportation facilities.

First hydraulic drive used in drilling. The fluid drive, recently introduced to the automotive field, improves torque characteristics of internal-combustion engines

La primera transmisión hidráulica empleada en la perforación. La transmisión o propulsión liquida, recientemente introducida en los automóviles, mejora las características de esfuerzo de rotación de los motores de explosión interna

LARGE DRILLING EQUIPMENT

Since the rotary drilling rig has been introduced, larger equipment has been used each year. Although 1939 has not been conspicuous for its drilling activity, larger equipment was introduced both on the

(Continued on Page 201)

stalado debajo del piso, el montacarga auxiliar y el piso de la torre. El piso de la torre se eleva a la altura deseada, sobre la base de emparrillado, mediante el uso de patas extendidas en la torre. Estas se aseguran con pernos al emparrillado a 8 piés debajo del nivel del piso.

En la mayor parte de los casos, se emplea hormigón debajo de las esquinas de la torre, pues esto se considera necesario cuando hay que manejar cargas pesadas en lugares donde el terreno se pone blando con las lluvias. Las subestructuras de acero, para torres, han tenido mucha aceptación. Estas se aseguran por pernos a los cimientos de hormigón y sirven para reemplazar el tipo de bloque de esquina de hormigón que se proyecta a buena altura sobre el nivel del piso. Por lo general, las subestructuras de acero se usan sólo debajo de las torres de perforación. La torre de perforación es más tarde reemplazada por una torre de producción o extracción, y las patas de la torre más pequeña se empernan directamente en el piso de hormigón de la torre.

CIMIENTOS PARA LAS BOMBAS

En las propiedades de la Shell Oil Co., Inc., en los campos de Round Mountain y Mountain View, en el Valle de San Joaquín, se observa un procedimiento de desarrollo muy bien coordinado, por regla general. Los pozos se completan aquí como pozos de bombeo, y una de las prácticas avanzadas es vaciar todo el hormigón por usarse durante la vida del pozo, antes de la perforación de un pié de agujero. El equipo de bomba se seleccionada, de acuerdo con las normas de la compañía, mucho antes del comienzo de la perforación.

Cuando la hormigonera se lleva a vaciar el hormigón para los cimientos de la torre y paredes del sótano, se vacía también el hormigón para el cimiento del grupo de la bomba. En esta ocasión se pavimenta el piso de la torre y se hace una plancha adicional de hormigón, al lado de la torre, para acomodar el camión de servicio, cuando éste se arrima a hacer trabajos de vástagos y tubería. Pesados bloques de hormigón, colocados debajo de la plancha, sirven, de anclajes de sujeción para el camión. Después de toda esta preparacion encaminada a la instalación del equipo de bomba, antes del comienzo de la perforación, sólo se requiere como 12 días para perforar el pozo y ponerlo en producción.

En lugares escabrosos o barrosos, se ha visto que se puede ahorrar mucho tiempo de mudanza, construyendo caminos adecuados a cada ubicación. En muchas partes del pías, semejante trabajo de construcción se considera demasiado costoso para ser práctico; pero, en un creciente número de casos, la primera actividad, a continuación de la fijación de una nueva ubicación, consiste en construir una carretera con superficie aceitada, adaptable a todo tiempo, hasta el punto de la perforación. En algunos casos, existen cifras impresionantes, que vienen a demostrar el gran ahorro de tiempo y la prevención de desgaste y averías al equipo, que se establecen mediante estas facilidades de transporte.

EQUIPO DE PERFORACION GRANDE

A continuación de la introducción de la perforación por sistema rotatorrio, se ha venido empleado un equipo más grande, año tras año. A pesar de que 1939 no ha sido notable por sus actividades en perforación, se introdujo durante esta año, un equipo más grande en los campos de la Costa del Golfo y California. Con los aparejos más grandes han venido velocidades de rotación más altas, mayor peso en la barrena y mayor rapidez en la perforación.

El caso más interesante de aparejo de tamaño aumentado ocurrió en California, donde una gran compañía petrolera compró un aparejo de construcción especial, que usa vapor sobrecalentado a 500 libras de presión.

(Continue en Pagina 201)

MODERN SPUDDERS

PERFORADORAS MODERNAS

You can cut cable tool drilling, tailing-in and well servicing costs with modern Bucyrus-Erie spudders. In these revolutionary machines modern engineering and modern construction methods have been applied to bring spudder design and operation in line with progress in other modern oil field equipment with many up-to-date time and money saving features.

These 1940 drills are more compact and convenient than old style machines in the field. They have an all-steel, all-welded box frame that holds the machinery in alignment for years of steady operation. There is no wood to rot, split or work loose at the joints. This construction gives greater strength and compactness for handling and moving. Reel capacities and speeds are improved; drilling action is speed-lined with modern efficiency for faster, penetrating strokes; bailing is fast and can be carried on for long periods without excessive wear or heating. Clutches and brakes are especially designed for oil operations and give smooth, accurate, safe control.

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Las perforadoras de 1940 son más compactas y más convenientes que las antiguas. Su bases de construcción son bastidores de tipo de caja, completamente soldados al arco eléctrico, y diseñados para mantener la maquinaria en perfecto alineamiento durante largos años de trabajo. No hay partes de madera que se puedan pudrir, cuartear, o aflojar.

La construcción es sumamente fuerte y no se deteriora, no obstante lo severo que set el trabajo o el terreno. Las capacidades de los carretes o tambores se han ampliado; la acción de perforar es más rápida y eficáz, y produce golpes mas fuertes y penetrantes; el vaciado se puede continuar por largos periodos sin peligro de desgaste o calentamiento excesivo. Los embraques y frenos son diseñados expresamente para trabajo petrolífero y permiten operación suave, segura, y exacta.

Pida informes sobre las perforadoras modernas Bucyrus-Erie. Hay un tamaño para cada trabajo. Escribanos hoy acerca de sus problemas.

The semi-trailer spudder moves at high speeds but releases the truck for other duties once it is on the job. Steel front wheels and axle are regular equipment

La perforadora de semi-remolque se puede mover a altas velocidades. Tambien permite que el camión haga otros trabajos. Las ruedas delanteras y el arbol delantero son de acero, y son "equipo standard"

Compact and fast moving, the truck mounted spudder is ideal in shallow oil fields where moves are frequent and sometimes long

Compacta y facil de transportar, la perforadora montada en camión es ideal en los campos petrolíferos de poca profundidad en donde se tiene que mover frequentemente

Where territory covered is small or very rough the trailer mounting is ideal. Rig may be towed by truck, team or tractor

Donde el terreno es escabroso y no muy grande, el montaje en remolque es ideal. El equipo puede ser halado por camión, tractor, o por animales

Ample power is provided by a heavy duty, dependable gasoline engine and is transmitted direct to the jackshaft through an endless belt. Diesel or electric engines are also available

El motor á gasolina, diseñado para trabajo sumamente pesado, provee suficiente potencia mediante el arbol principal, conectado con correa. Si se desea, las perforadoras pueden ser equipadas con motores diesel o eléctricos

Centralized controls make it possible for the operator to control every operation instantly and accurately from one position

Los controles centralizados permiten al operario manejar la maquina eficaz e instantaneamente desde un lugar

Operating one lever reduces hoisting speed and increases the pull on the swabbing line to 2½ times that obtained with the high speed hoist

Una palanca disminuye la velocidad de izamiento y aumenta el tiro de la linea limpiadora 2½ veces más que el que se obtiene con ascensor de alta velocidad

Solidly and compactly built, Bucyrus-Erie spudders contain such outstanding features as the positive direct-drive, automatic feed and chain-drive, clutch controlled sand reel. All parts are held in rigid alignment by the all-steel, all-welded box frame

Construidas solida y compactamente, las perforadoras Bucyrus-Erie contienen tales ventajas como: impulsion directa positiva, alimentación automática, y carrete de arena impulsado por cadena y controlado por embrague. Todas las partes se tienen en perfecto alineamiento por el bastidor de tipo de caja, completamente soldado

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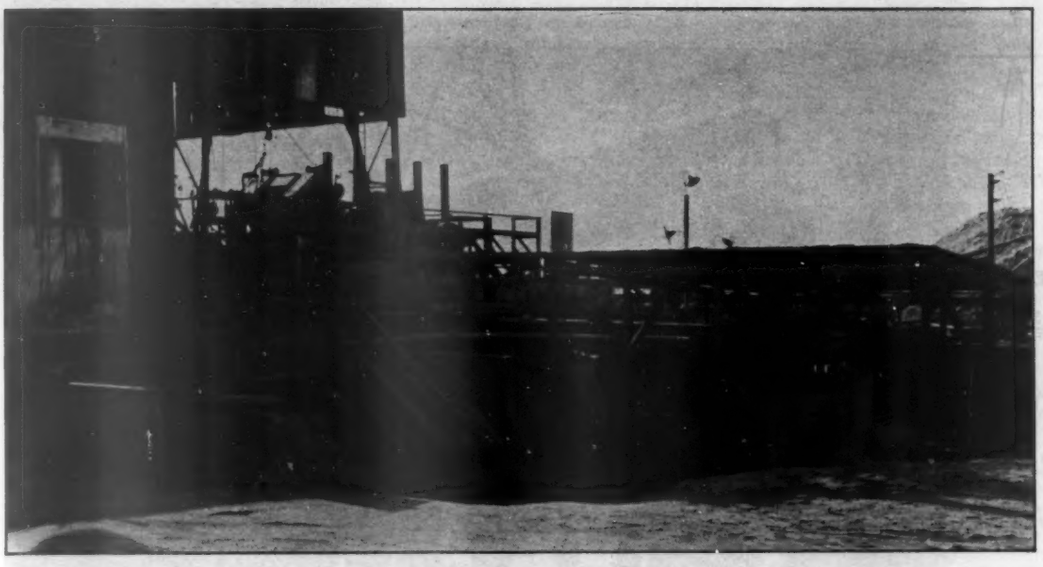


A California company sets slush pumps in an excavation to obtain flooded suction and increase volumetric efficiency.

Una empresa en California instala bombas para líquidos lodosos, en una excavación, para obtener conveniente succión y aumentar el rendimiento volumétrico

Gulf Coast and in California. With the larger rigs have come faster rotating speeds, greater weight on the bit, and faster progress in drilling.

Most conspicuous example of increased rig size occurred in California, where Superior Oil Co. purchased a specially designed rig that uses superheated steam at 500 lb. pressure. Heretofore 350 lb. has been the maximum steam pressure used in oil-field work. Steam at this pressure is generated by a battery of five 130-hp. boilers with integral superheaters. The draw-works engine, largest yet used, is a 15 by 14-in. twin, and will develop 1,700 hp. under maximum steam pressure.

In the past some difficulty has been encountered due to the small safety factor offered by 1¼-in. drilling line at depths below 12,000 ft. The super rig uses a larger draw works which will accommodate a 1½-in. line. This necessitates a much larger drum diameter, and, therefore, brakes of much greater capacity must be used. To control the weight of lowering the drill pipe a double-rotor hydromatic brake is used.

Largest slush pumps ever manufactured are the 15½ by 9¼ by 22-in. units used at the Superior super rig. These are operated at 500 lb. steam pressure, and require a special 5-in. steel rotary hose to handle the discharge.

A few years ago the largest steam engine manufactured for oil-field use was a 12 by 12-in. twin. The Superior rig uses two such engines, one to turn the rotary table and the other to operate the standby hoist. The rotary-table engine is located below the derrick floor. Both of these engines use 350-lb. steam, the boiler pressure being reduced by a regulator in their steam line.

Several years ago most rotary rigs were operated at speeds of about 100 r.p.m. These speeds have constantly increased, particularly on the larger rigs, so that now rotary speeds in excess of 600 r.p.m. are sometimes found. This increase has been possible because of the great improvements in drill-pipe metallurgy and design, and because many of the later rigs are designed to make more speed adjustment possible at the rotary table. Many rigs of the large types use an individual prime mover for the rotary table, which may be a steam engine, internal-combustion engine, or an electric motor. Rigs on which the rotary table is driven by the draw-works engine often have six possible speeds for a constant engine speed. Also, a special chain unit has recently been introduced which is placed between draw works and table. This makes possible three rotary-table speeds for each draw works speed. It has been found that vibrations play a conspicuous part in determining the suitability of various rotary speeds. At some speeds vibrations become severe, but these can be avoided by increasing or decreasing the speed.

MORE DRILLING WEIGHT

In the early days of rotary drilling a large part of the weight of the drill pipe was carried on the rotary bit while drilling was in progress. This led to crooked holes, an evil that still exacts a heavy toll every year from the concerns that are faced with having to pump such wells. It soon became realized that it was necessary to hold up all but a small part of the drill-pipe weight, if crooked holes were to be avoided. Since less weight generally meant slower progress, the idea was soon advanced that a concentration of weight at the bottom on the drill stem would serve to impart the

Hasta ahora, la presión máxima de vapor, usada en trabajo de pozo de petróleo, había sido de 350 libras. El vapor, a esta presión, se genera por una batería de cinco calderas de 130 cdf. con supercalentadores en grupo. La máquina de aparejo de maniobras más grande de todas las empleadas hasta ahora, es una gemela de 15 por 14 pulgadas, que desarrolla 1.700 cdf. bajo máxima presión de vapor.

En el pasado, se ha tropezado con cierta dificultad, a causa del pequeño factor de seguridad ofrecido por el cable perforación de 1¼", a profundidades debajo de 12.000 piés. El nuevo aparejo de gran tamaño usa un malacate más grande, que admite muy bien un cable de 1½". Esto requiere un mayor diámetro de tambor, y por esta razón, es necesario emplear frenos de mucho mayor capacidad. Para regular el peso de la bajada de la tubería de perforación se emplea un freno hidromático de doble rotor.

Las bombas de lodo más grandes de todas las fabricadas son modelos de 15½ por 9¼ por 22 pulgadas. Se usan en el aparejo Superior de gran tamaño. Estas bombas funcionan a una presión de vapor de 500 libras y para en manejo de la descarga se requiere una manguera especial para equipo rotatorio, de acero, de 5 pulgadas.

La máquina de vapor más grande, de todas las fabricadas para trabajos de extracción de petróleo, fué una gemela de 12 por 12 pulgadas, hecha hace pocos años. El aparejo Superior usa dos de estas máquinas, una para accionar la plataforma de la rotatoria, y otra para accionar el malacate auxiliar. La máquina de la plataforma de la rotatoria está instalada debajo del piso de la torre. Ambas máquinas usan 350 libras de vapor, reguládose la presión de caldera por un regulador en su tubería.

Hasta hace varios años, casi todos los aparejos de tipo rotatorio funcionaban a velocidades de como 100 r.p.m. Estas velocidades se han venido aumentando constantemente, particularmente en los aparejos más grandes, de suerte que hoy en día, han llegado, en muchos casos, a 600 r.p.m. Este aumento ha sido posible a causa de los grandes progresos en la metalurgia y fabricación de la tubería de perforación, y también, a causa de que los aparejos de más reciente construcción se construyen de modo que proveen más ajustes de velocidad en la plataforma de la rotatoria. Muchos aparejos de tipo grande usan una máquina generadora de energía para la plataforma de la rotatoria, que puede ser una máquina de vapor, un motor de explosión interna o un motor eléctrico. Los aparejos en que la plataforma de la rotatoria está movida por el motor del malacate, a menudo tienen seis velocidades posibles para una constante velocidad de motor. Por otra parte, recientemente se ha introducido un dispotivo de cadena, que se coloca entre el malacate y la plataforma. Esto hace posible tres velocidades de plataforma por cada velocidad de malacate. Se ha visto que las vibraciones desempeñan un papel muy importante en la determinación de la adaptabilidad de las varias velocidades del equipo rotatorio. A ciertas velocidades, resultan severas las vibraciones, pero éstas pueden evitarse aumentando o moderando la velocidad.

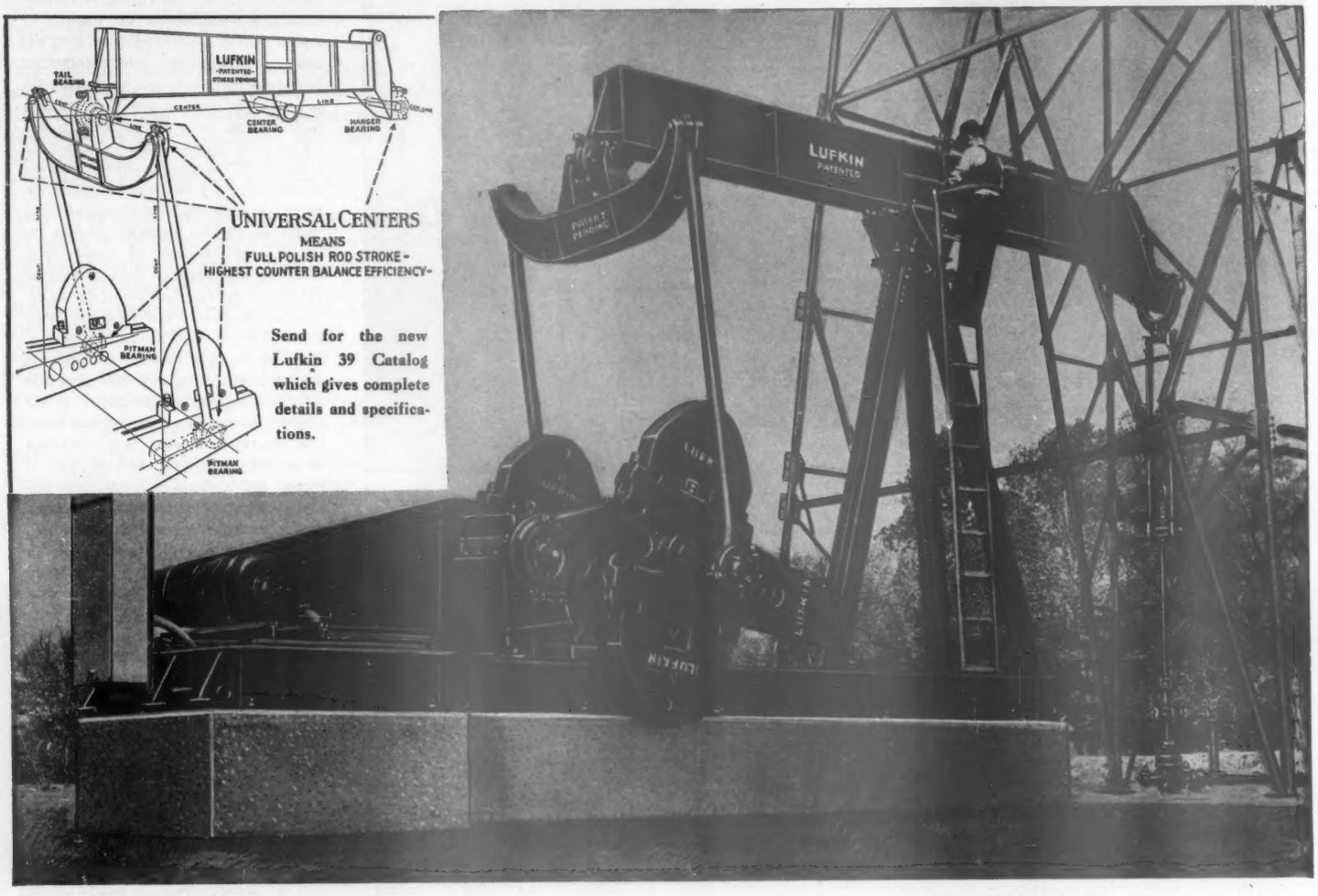
MAYOR PESO EN LA PERFORACION

Al comienzo de la perforación por el sistema rotatorio, una gran parte del peso de la tubería de perforación recaía sobre la barrena, mientras se hacía el trabajo. Esto conducía a agujeros ladeados, un mal que todavía impone grandes penas anuales a las empresas que se ven obligadas a extraer petróleo de semejantes pozos. Pronto se comprendió que era necesario sostener casi todo el peso de la tubería de perforación, a fin de evitar el ladeamiento del agujero. Como el menor peso significaba generalmente un avance más lento, pronto se avanzó la idea de que una concentración de peso al fondo del vástago de la barrena, serviría para impartir las características de una plomada a la columna de perforación. Debido a la frecuencia de los trabajos de pesca o salvamento, las empresas explotadoras se sintieron refractarias a aceptar una innovación que pudiera servir para acentuar más aún la dificultad de los trabajos de pesca que se presentaban.

Los agujeros más rectos, la tubería de perforación mejorada, el mejor lodo para el equipo rotatorio y la técnica más avanzada, condujeron a una mayor reducción en trabajos de pesca. Se hizo así factible el empleo de pesados collares de perforación, encima de la barrena, para darle

Universal LUFKIN Unit Assemblies

Send for the new Lufkin 39 Catalog which gives complete details and specifications.



Typical Lufkin installation

LUFKIN—Pioneers in Geared Units

The first Lufkin geared unit for oil field pumping was installed in a Texas oil field in 1924. This was the first reduction gear unit to ever successfully operate in deep production. Since that time Lufkin Units have been installed in every major field of the world and today are considered standard equipment by more than three hundred major operators in domestic and foreign fields. So completely has the LUFKIN GEARED UNITS revolutionized the method of pumping oil wells, that it is now conceded by engineers high in the oil industry, that geared units are the modern accepted medium by which power is transferred from the prime mover to the polish rod.

Lufkin gear units are principally of the Herringbone type, but are also furnished in worm gear type and are manufactured in sizes to suit any field condition from shallow production to the world's deepest wells. Central geared pumping powers are available from 50 to 150 horsepowers.

Auxiliary equipment such as beams, posts, pitmans and all types of surface equipment are also manufactured in the most improved types.

EXPORT SERVICE

All equipment for export are carefully crated in steel-bound and bolted crates conforming to custom regulations of countries to which shipped. Export offices are maintained in New York at 149 Broadway.

Una instalación típica "Lufkin."

LUFKIN—Los primeros en grupos de engranajes

El primer grupo de engranajes Lufkin, para bombaje de petróleo, fué instalado en un campo petrolífero de Texas en 1924. Este grupo fué el primer mecanismo o equipo de engranajes desmultiplicadores en funcionar con éxito en la extracción de petróleo de pozos profundos. Desde entonces, los equipos Lufkin se han instalado en casi todos los campos petrolíferos más importantes y se consideran actualmente como la norma de la industria por más de trescientas importantes empresas petroleras nacionales y extranjeras. Los GRUPOS DE ENGRANAJES LUFKIN han revolucionado el método de bombaje de los pozos de petróleo hasta el punto de que los ingenieros del ramo les acuerdan el primer lugar en su campo, reconociendo que son los mecanismos modernos y eficaces para la transmisión de la energía del motor al sistema de aspiración.

Los equipos de engranajes desmultiplicadores o de reducción Lufkin son principalments del tipo de espina de pez, pero se ofrecen también en tipo de tornillo sin fin. Por otra parte, se ofrecen también en tamaños convenientes a todas las condiciones posibles de explotación, para pozos de baja profundidad, lo mismo que para los pozos más profundos del mundo. Ofrecemos grupos motores centrales de bombaje con capacidades de 50 a 150 c. de f.

El equipo auxiliar, como balancines, montantes, bielas de conexión y otros accesorios de instalación exterior, se ofrece también en modelos o tipos notablemente perfeccionados.

SERVICIO DE EXPORTACION

Todo material destinado a la exportación se empaca con sumo cuidado en huacales bien sujetos por precintas de acero y pernos, en conformidad con las evigencias aduaneras de los países de destino. El departamento de exportación está en 149 Broadway, Nueva York, N. Y., E. U. A.

LUFKIN FOUNDRY & MACHINE CO., LUFKIN, TEXAS

NEW YORK CITY	LOS ANGELES	HOUSTON	DALLAS	TULSA
A. V. Simonson	E. P. Trout	A. B. Bennett	L. A. Little	D. A. Reid
149 Broadway	5959 So. Alameda	706 2nd Natl. Bank Bldg.	1317 Magnolia Bldg.	719 Thompson Bldg.

OTHER OFFICES IN PRINCIPAL OIL FIELDS

characteristics of a plumb bob to the drilling column. Because of the frequency of fishing jobs, operators were reluctant to adopt an innovation that might serve to intensify the trouble when fishing jobs were encountered.

Straighter holes, together with improved drill pipe, improved rotary mud and better technique, led to a greater reduction in fishing jobs. Thus it became feasible to use heavy drill collars above the bit for additional weight. In some cases nearly 400 ft. of drill collars are used, weighing 147 lb. per foot; but this is common only in the deep fields of California. The entire weight of drill collars is not carried on the bit, as it is deemed necessary to hold up part of the weight to prevent the drill pipe from whipping at high speeds. In some cases lead sleeves have been used around the drill collar to concentrate the weight on bottom. The sleeve is designed so that it can be used as a jarring tool in case the bit becomes stuck.

STRAIGHT-HOLE DRILLING

There was a period, recently passed, when dissension existed between producing organizations and drilling contractors. Producers insisted on straight holes; contractors considered this unreasonable because it appeared that drilling would be considerably retarded if they were to comply. Now it has become apparent that the straight hole is cheaper to drill than the crooked hole. Fishing jobs are less frequent; there is less wear on the drilling equipment, and the drilling time is reduced in the long run. To be sure, progress may be more rapid for a while, if no attention is paid to direction of the bit; but when the hole becomes crooked, part of the weight applied to the bit serves only to force the drill collar against the lower side of the hole, thereby misguiding the bit. Also, part of the torque applied to the drill pipe must be dissipated in overcoming wall friction.

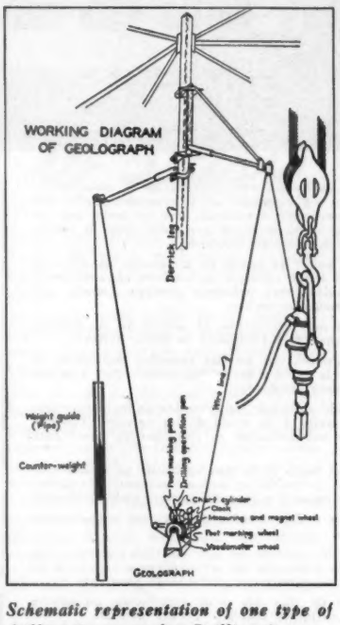
In modern drilling practice a straight hole is never sacrificed for speed, since a straight hole is a necessity for continued speed. Frequent tests are made with accurate drift-indicating or well-surveying instruments. These tests are taken as close to bottom as possible. It has been found that, when the bit migrates from the vertical, correction is easily made if the condition is recognized before it becomes severe. A hole a few degrees off can be returned to the vertical by decreasing the weight on the bit, whereas plugging back and redrilling may be necessary if the bit is more seriously misguided. Not long ago vertical tests were made only to see if the hole met contract specifications; and they were often made after drilling had been nearly completed. Now they are used by the driller as a means of determining what procedure will give the most rapid progress without misdirecting the bit. Weights and rotating speeds are continually adjusted in accordance with information gained from the vertical tests.

TWO POWER TYPES

Greater foresight exercised toward avoiding trouble has resulted in the use of a standy hoist whenever deep drilling is undertaken. In case of trouble in the draw works, or in the draw-works engine, the standby hoist and standby engine are used to pull the drill pipe before it can stick. Continental Oil Co. has carried this line of thought a step farther by providing a separate source of power for the standby hoist. On its 15,004-ft. producer in California it used an electric motor with purchased-power connections as the prime mover on the standby hoist. In all other respects the rig was steam-operated. On the company's deep test in Oklahoma (No. 1 Proctor) it used a diesel engine connected mechanically to the standby hoist. The rig was otherwise diesel-electric.

Two types of power may be used on drilling rigs for reasons other than as a safety measure. It is reported that economy has resulted in some cases where both steam and internal-combustion engines have been used. For hoisting service the flexibility of a steam engine is de-

(Continued on Page 208)



Schematic representation of one type of drilling-time recorder. Drilling-time records supplement the information gained from coring and electric logging

Representación esquemática de un tipo de registrador de tiempo de perforación. Los registros de tiempo de perforación suplementan a la información ganada de los informes diarios de la sacadura de núcleos y registros eléctricos

peso adicional. En algunos casos, se usan hasta casi 400 piés de collares de perforación, que pesan 147 libras por pié; pero esto es común sólo en los yacimientos profundos, que hay en California. El peso completo de los collares de perforación no recae sobre la barrena, pues se ha visto que es necesario sostener parte del peso, para evitar que la tubería de perforación se sacuda en las altas velocidades. En algunos casos se han empleado manguitos de plomo alrrededor del collar de perforación, para concentrar el peso al fondo. El manguito está construído de modo que puede emplearse de herramienta percusora en caso de atascamiento de barrena.

PERFORACION DE AGUJERO EN LINEA RECTA

Hubo un período, pesado hace poco, en que existió disensión entre las empresas productoras y los contra-

The hydraulic drilling-time recorder uses a tube filled with fluid with a small reservoir at its upper end. Height of the rotary swivel determines pressure on the recorder

El registrador hidráulico de tiempo de perforación se vale de un tubo lleno de líquido, con un pequeño depósito en su extremo superior. La altura del acoplamiento giratorio determina la presión sobre el registrador

tistas de perforación. Los productores insistían en agujeros rectos y los contratistas consideraban esto desrazonable, pues anticipaban que al acceder a la demanda de rectitud, se retardaría mucho la perforación. Ahora se sabe que es más económica la perforación de un agujero en línea recta que la de otro torcido o ladeado. Los trabajos de pesa o salvamento son menos frecuentes; hay menos desgaste de equipo de perforación, y el tiempo de la perforación se reduce considerablemente, a la larga. Seguramente, el progreso será más rápido, por algún tiempo, si no se da atención a la dirección de la barrena; pero, cuando se tuerce o ladea el agujero, parte del peso aplicado a la barrena sirve sólo para formar el collar de perforación contra el lado más bajo del agujero, desviando así más la dirección de la barrena. Además, una parte considerable del esfuerzo de rotación aplicado a la tubería de perforación se disipa en vencer la oposición, es decir, el rozamiento de la pared.

En la moderna práctica de perforación, la rectitud del agujero nunca es sacrificada a la rapidez de la perforación, pues el agujero en línea recta es esencial a la rapidez contínua del trabajo. Se hacen frecuentes rectificaciones con exactos instrumentos indicadores de desviación u otros aparatos a propósito. Estas rectificaciones o ensayos se hacen lo más cerca posible del fondo. Se ha visto que cuando la barrena se aparta de la línea vertical, se puede rectificar su dirección con facilidad, cuando oportunamente se apercibe la desviación, antes de que ella se ponga muy grave. Un agujero con pocos grados de desviación puede rectificarse a línea vertical reduciendo el peso en la barrena. Al tratarse de un agujero demasiado desviado, se impone entonces la necesidad de obturarlo y perforarlo de nuevo. Hasta hace pocos años, los ensayos de línea vertical se hacían sólo para ver si el agujero concordaba con las estipulaciones del contrato, y a menudo se efectuaban después de efectuada la perforación. Actualmente se usan por el perforador como un medio de determinar qué procedimiento dará el más rápido progreso, sin desviación de la barrena. Los pesos y las velocidades de rotación se ajustan continuamente de acuerdo con la información ganada de los ensayos de la vertical.

DOS TIPOS DE FUERZA

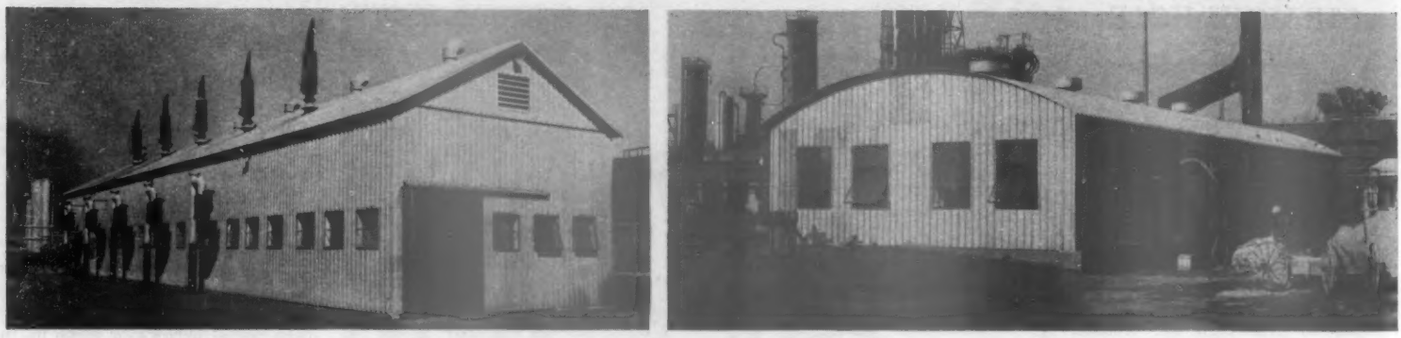
La mayor previsión ejercida en el sentido de evitar dificultades ha tenido por resultado el uso de un montacarga auxiliar, en conexión con la perforación a grandes profundidas. En caso de irregularidad en el aparejo de maniobras o malacate, o en el motor del malacate, el montacarga auxiliar y su motor se emplean para levantar la tubería de perforación, antes de que ésta se atasque. La Continental Oil Co. ha amplificado esta idea instalando una fuente separada o independiente de fuerza para el montacarga auxiliar. En su pozo activo de 15.004 piés de profundidad, en California, usó un motor eléctrico, accionado con corriente comprada de afuera, como la fuente de energía principal para el montacarga auxiliar. En todo otro sentido, el aparejo fué accionado con fuerza de vapor. En el pozo de ensayo de gran profundidad de esta misma compañía,

(Continue en Pagina 208)

BUTLER *Ready-Made* STEEL BUILDINGS

COMPLETE, READY TO ERECT QUICKLY WITH UNSKILLED LABOR

FIRE-SAFE, DURABLE, LOW IN FIRST COST, ERECTION AND MAINTENANCE



Through three decades of specialized experience in manufacturing for the oil industry, Butler engineers have developed a ready-made, section unit construction which has made Butler Steel Buildings the widely recognized standard shelter for oil industry operations.

All Butler Steel Buildings are carried on especially designed structural steel framework. It is fabricated in units or sections most practical for handling, shipping and quick assembly by bolting together in erection.

Unique and advanced shaping is employed in the steel wall and roof sheeting of Butler Steel Buildings:

Figure A—Deeply drawn panel corrugations with side shoulders multiply the strength of wall and roof sections fourfold over ordinary corrugated steel sheets.

Figure B—Shows the method of closing ends of panel corrugations at bottom and top edges of walls. Also shows how corners are formed in panel sections to eliminate corner laps.

Figure C—Roof sections are die-formed at the ridge to eliminate the need for ridge roll and to give a stronger, smoother, weather tight finish to pitch roof buildings.

Figure D—Die-forming also turns projecting eaves downward for finished appearance.

Figure E—Shows a simple method of anchoring furring strips with furring clips for carrying interior linings of commercial wall board or plaster on steel lathing.

Stationary or ventilating type steel window sash of a large range of sizes meets any daylighting requirements.

Plain paneled or paneled and glazed swinging doors may be selected from 8 sizes. Overhead doors of the latest type, or sliding and rolling doors in all sizes, including large ones for locomotives or air transports, are fitted to any requirement.

Both the stationary and revolving types of roof ventilators are offered to provide roof ventilation for any Butler Steel Building.

More detailed information on standard and special types, along with scores of photographs of installations, are contained in the Butler Steel Building Catalog. SENT FREE ON REQUEST. Estimates and proposals will be submitted promptly and without obligation.

Detailed erection plans and instructions are supplied, which, with complete materials, systematically marked, make erection simple and possible with almost any type of labor.

Gracias a tres décadas de experiencia especializada en la manufactura para la industria del petróleo, los ingenieros de la compañía Butler han perfeccionado un tipo de construcción seccionada, que ha hecho que los edificios de acero Butler sean universalmente aceptados como la norma del ramo en los trabajos de la industria petrolífera.

Todos los edificios de acero Butler se arman en armazones de acero de construcción de tipo especial. Estos edificios se fabrican en unidades o secciones separadas, que resultan muy prácticas para su manejo, embarque y rápida instalación mediante pernos.

Una formación única, de tipo muy adelantado, se emplea en las láminas de acero de las paredes y techos de los edificios de acero Butler:

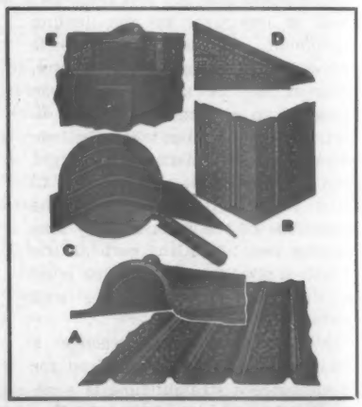
Figura A—Las canales profundas con amplios rebordes multiplican la firmeza de las secciones de la pared y del techo, cuatro veces más que las láminas ordinarias de acero acanalado.

Figura B—Muestra el método de cerrar los extremos de los panels acanalados en los bordes de arriba y de abajo de las paredes. También muestra cómo las esquinas son formadas en secciones de panel para suprimir traslapo esquinado.

Figura C—Las secciones del techo se forman en molde en el caballete para suprimir la necesidad de rodillo y dar un acabado más firme, suave y seguro contra la intemperie a los edificios con techo inclinado.

Figura D—La formación en molde también gira tejaros proyectandos de bája par el fin de vista.

Figura E—Muestra un sencillo método de fijar las tiras de forro, con sujetadores de forro para la colocación de revestimientos interiores de tablas comerciales de pared, o yeso sobre enlistonado de acero.



Marcos de ventana de acero de tipo fijo o de ventilación, en amplia escala de tamaños, satisface cualquier requisito de luz natural.

Se da elección a 8 tamaños de puertas giratorias de panel sencillo a de panel y vidrio. Puertas de acero suspendidas, del último tipo, o puertas corredizas o rodantes, en todo tamaño, incluyendo las grandes para locomotoras y aviones, se ajustan a cualquier requisito.

Los ventiladores de techo en tipos fijos y giratorios se ofrecen para proveer ventilación de techo para cualquier edificio de acero Butler.

A SOLICITUD ENVIAREMOS GRATUITAMENTE el catálogo de edificios de acero Butler, que contiene información detallada sobre tipos normales y corrientes, incluyendo fotografías de instalaciones diversas. Con toda prontitud e incondicionalmente someteremos presupuestos sobre sus requisitos.

Suministramos planos e instrucciones de instalación, lo cual, en combinación con los completos materiales, sistematicamente marcados, hace posible la erección de estos edificios con la ayuda de cualquier tipo de obreros locales.

BUTLER MANUFACTURING COMPANY

KANSAS CITY, MO. MINNEAPOLIS, MINN.

BUTLER BOLTED TANKS

RUNWAYS AND SEPARATORS *Made Stronger to Last Longer*

Butler Bolted Tanks are manufactured to conform to A.P.I. Specifications. Dimensions, capacities and gauges are standardized. Beyond this standardization, however, Butler Bolted Tanks offer many additional advantages, some of which are set forth below.

Sections of both the decks and bottoms of Butler Bolted Tanks are "pie shaped," of uniform size, which affords maximum interchangeability and saves time in erection, cutting down and re-erecting. The uniformity of the bolted seams running from the center to the shell adds extra strength and rigidity. In addition to generous lapping of sections, all seams are reinforced with heavy steel channels which also serve to hold bolt heads from turning.

The rubber packing in seams of Butler Bolted Tanks is selected for durability in use with oil, is cloth inserted for strength, is resilient under compression, and punched with holes smaller than the bolts to fit snugly around the bolts to hold leak-tight seams.

Heat treated bolts with high tensile strength permits drawing leak-tight seams on Butler Bolted Tanks without stripping threads or twisting off heads. The Butler clean-out plate is large enough for easy entry of clean-out crew, is reinforced and designed for removal without entering the tank to hold bolt heads from turning.

Angle iron rafters on Butler Bolted Tanks do away with wavy, springy decks—free seams of stress that soon affects their vapor tightness.

The heavy steel ladder in the center of Butler Bolted Tanks is attached to the steel rafter structure and affords rigid support to the decks at the center.

The one-piece, flanged collar of the Butler manhole bolts down tightly over C.I. rubber to form a gas-tight connection with the triangular deck sections. Built into this non-sparking aluminum fitting are a combination weighted and springless 2-ounce pressure valve, ½-ounce vacuum valve, thief-hatch and thief-rest, all inside and under the hinged lid.

BUTLER RUNWAYS AND STAIRWAYS

Designed and constructed to secure the maximum of strength per pound of steel, Butler Runways and Stairways are bracketed directly to the tanks without a network of ground supports. Regulation guard rails, non-skid and drained treadways make Butler Runways and Stairways safe, trim and economical.

BUTLER DRANE SEPARATOR

Utilizes all the principals of separation—expansion, centrifugal scrubbing and impinging—at low pressure. Delivers cleaner dryer gas.

Los tanques empernados Butler se construyen de acuerdo con las características de la A.P.I. Las dimensiones, capacidades y espesores están todos uniformados o normalizados. Sin embargo, además de esta normalización, los tanques empernados Butler ofrecen muchas otras adicionales ventajas, algunas de las cuales anotamos a continuación.

Las secciones de las cubiertas y fondos de los tanques empernados Butler tienen una forma especial y un tamaño uniforme, que facilita mucho su intercambio ahorrando mucho tiempo en el montaje, desmontaje y reinstalación. La uniformidad de las costuras empernadas aumentan mucho la firmeza y rigidez. En adición a amplia solapadura de las secciones, todas las costuras están reforzadas con grueso acero acanalado, que sirve también para evitar que las cabezas de los pernos se giren. La empaquetadura de caucho en las costuras de los tanques empernados Butler es elegido en vista de su duración en uso con el petróleo. Está insertado en tela, para mayor firmeza, es elástico bajo compresión y con perforaciones menores en diámetro que los pernos, para ajustar apretadamente alrededor de éstos y asegurar costuras perfectamente herméticas al escape.

Los pernos tratados termicamente, de gran resistencia a la tracción, permiten apretar bien los tanques empernados Butler sin peligro de rebajar o destruir las roscas o de torcer las cabezas de los pernos. La placa de limpieza del tanque Butler es bastante grande para permitir fácil entrada y está reforzada y dispuesta para quitarse sin necesidad de entrar al tanque para sujetar las cabezas de los pernos, para que no giren.

Los tensores de hierro en ángulo de los tanques empernados Butler evitan la oscilación u ondulación de las cubiertas y libran a las costuras de la tensión que pronto afectaría su hermeticidad a los vapores.

La firme escalera de acero, en el centro de los tanques empernados Butler, esta unida a los tirantes o tensores de acero y provee rígido soporte a las cubiertas en el centro.

El collar con brida enterizo del agujero de hombre se aprieta firmemente sobre caucho formando una conexión hermética al gas con las secciones triangulares de las cubiertas. Colocadas dentro de esta conexión de aluminio protegida contra chispas hay una válvula de presión de 2 onzas de tipo de combinación, una válvula de vacío de ½ onza y dispositivos probadores, todo dentro y debajo de la tapa abisagrada.

PASILLOS Y ESCALERAS BUTLER

De especial construcción para obtener lo máximo en firmeza por libra de acero, los pasillos y escaleras Butler están soportados directamente en los tanques, sin red de soportes sobre el suelo. Las barandas de regulación y los pisos antideslizantes y bien desagüadoshacen que los pasillos y escaleras Butler sean seguros, económicos y de bonita presentación.

SEPARADOR BUTLER DRANE

Utiliza todos los principios de separación—expansión, frotación centrífuga y choque o vibración—a baja presión. Suministra un gas más limpio y seco.

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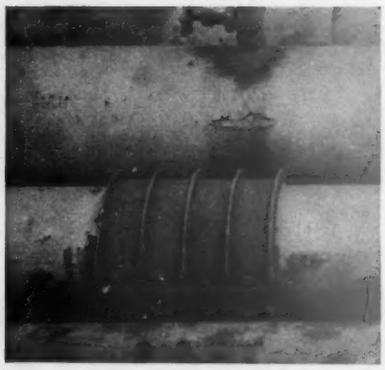


← EMERGENCY PIPE CLAMP

FOR stopping leaks in pipe lines, instantly, permanently. Quickly, easily applied. Pipe sizes ½" to 12". Standard in the petroleum industry for nearly forty years.

← ABRAZADERA DE TUBO DE EMERGENCIA

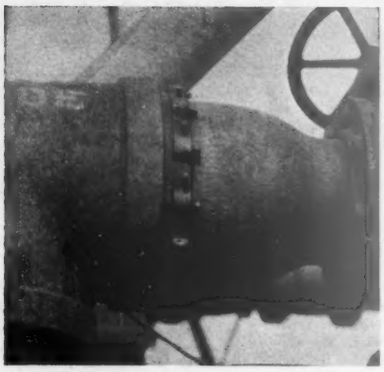
PARA tapar escapes o fugas en las líneas de tubería, de un modo instantáneo y permanente. Se aplica con rapidez y facilidad. Para tubos de ½" a 12" de diámentro exterior. La norma en la industria petrolera desde como cuarenta años.

PIPE LINE CLAMP →

FOR repairing long splits or very bad corrosion in pipe lines. Tremendously strong—suitable for highest pressures.

ABRAZADERA DE LINEA DE TUBERIA →

PARA reparar grietas largas o secciones muy corroídas en líneas de tubería. Extraordinariamente firme y muy adecuada a las presiones más altas.



← PIPE JOINT CLAMP

FOR stopping leaks at joints where pipe is screwed into a fitting—any thread leak at tee, elbow, flange, gate coupling, or master gate. Without shutdown. Absolutely permanent.

← ABRAZADERA DE UNION DE TUBERIA

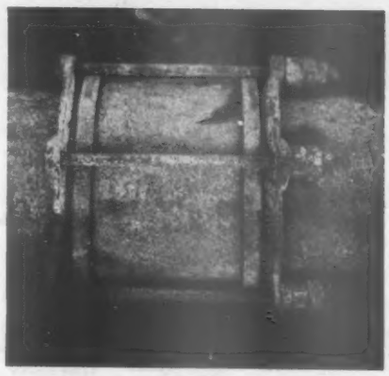
PARA tapar escapes o fugas en las uniones en que el tubo está atornillado en una conexión—cualquier escape por la rosca de una T, codo, brida, acoplamiento de válvula de compuerta o válvula de compuerta principal. No hay que cerrar el sistema. Absolutamente permanente.

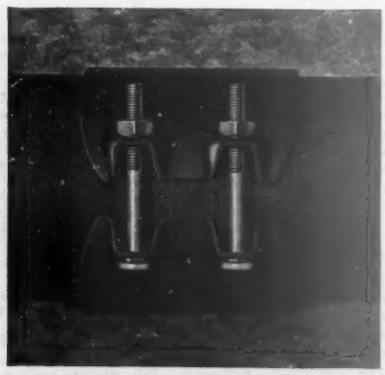
COLLAR LEAK CLAMP →

FOR stopping every type of collar leak, regardless of kind of collar used, or condition of line. Rough, tapered, or uneven collars easily clamped.

ABRAZADERA DE COLLAR PARA FUGAS DE TUBERIA →

PARA tapar toda clase de fuga o escape por el collar, sin consideración del tipo de collar usado o condición de la línea de tubería. Fácil sujeción de los collares toscos, cónicos o desiguales.





← PRESSED STEEL ECONOMY CLAMP

FOR repairing badly pitted and corroded pipe lines, at a minimum of cost. A tremendously strong clamp —sold in quantities for less than the cost of home-made repairs.

← ABRAZADERA ECONOMY DE ACERO ESTAMPADO

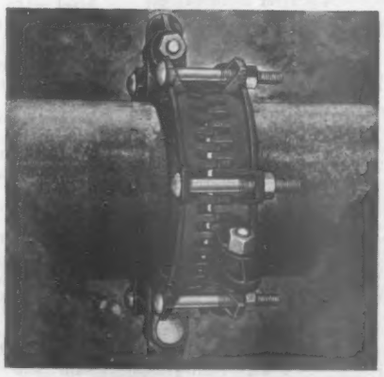
PARA reparar líneas de tubería muy picadas o corroídas, a un costo mínimo. Una abrazadera enormemente firme, que en grandes cantidades se vende por menos del costo de las reparaciones hechas en casa.

HIGH PRESSURE WELD CLAMP →

FOR stopping pin hole leaks or splits in welds on welded steel pipe lines. A tremendous time-saver. Tested to 800 lbs. line pressure.

ABRAZADERA DE ALTA PRESION PARA SOLDADURAS →

PARA tapar escapes o fugas y cerrar grietas en las soldaduras de líneas de tubería de acero soldada. Admirable por el ciempo que ahorra. Ensayada a una presión de línea de 800 libras.



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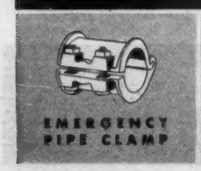
EMERGENCY PIPE CLAMP

PIPE LINE CLAMP

PIPE JOINT CLAMP

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FILTROL PRODUCTS

sirable. For driving pumps and rotary table internal-combustion engines offer far greater fuel economy. While it may be uneconomical to maintain a boiler plant and keep steam up only for hoisting service, the use of insulation may make it practical.

A deep test drilled in Alaska by Iniskin Drilling Co. used steam for all services during the first two summers of drilling. Fuel oil for the boilers was shipped from California and hauled overland 6 miles to the drilling site. Diesel engines were installed the third summer to operate the slush pumps and rotary table. The fuel consumption was decreased by 40 per cent, and each service was provided with a type of power suited to the duty.

HYDRAULIC DRIVE

In the Mid-Continent fields, and in the eastern fields of the United States, the use of internal-combustion-engine drilling rigs has been widely accepted due to their portability, their economy of fuel and water, and their reduction of fire hazard. However, while the torque characteristics of these engines are suitable for driving slush pumps and turning the table, they are not ideal for hoisting service. The ideal prime mover for hoisting service is one that will give maximum torque at low speeds, as will the steam engine or the d.c. electric motor. Since internal-combustion engines give maximum torque at high speeds, a system of gears and an efficient clutch have always been included with which to pick up heavy loads from rest while the engines are running at high speed.

In recent months a type of drive known as the hydraulic torque converter has been introduced into drilling procedure. Its purpose is to provide an approach to the flexibility of steam-engine power without sacrificing the fuel economy of internal-combustion engines. Transmissions of this type have been adopted in the design of some automobiles, and are also being applied on power shovels and on railroad switch engines where internal-combustion engines are used.

When starting and accelerating heavy loads with the torque converter, the engine operates at normal speed, but the output shaft rotates at a greatly reduced speed. The greater the speed difference between engine and output shaft the greater is the torque on the output shaft; and, like the steam engine, the torque becomes greatest when the output shaft is completely stalled. When stalling occurs, the engine continues to run at normal speed and the torque on the output shaft becomes about five times that on the engine shaft. Speed range of the output shaft ranges from zero to two-thirds the speed of the engine shaft.

The hydraulic torque converter is based on the hydro-kinetic principle. Its operation depends on the circulatory movement of fluid for the transmission of power. Since there is no rigid connection between the engine and the driven machine, the fluid absorbs shock loads, cyclic variations of the engine, and provides for smooth starting of loads.

The hydraulic portion of the converter consists of three essential parts: the pump, the turbine, and the stationary housing. The pump, which is coupled to the engine, converts the engine power into circulation of the fluid, thus creating a fluid head. The turbine, which is coupled to the output shaft, converts the fluid head built up by the pump into power. The turbine consists of a rotor on which are mounted three separate sets of blades. In the stationary housing two rows of blades are located so that they fit between the three turbine stages.

The converter has a flat efficiency curve with a peak of about 85 per cent. To insure satisfactory operation, the greatest amount of work should be accomplished in the torque-speed range where efficiency is above 70 per cent. When operated

A traveling laboratory for core analysis in Illinois

Un laboratorio ambulante, para el análisis de núcleos o muestras, en Illinois

en Oklahoma (Proctor No. 1) se empleó un motor diésel, conectado mecánicamente al montacarga auxiliar. El aparejo, en todo otro sentido, fué accionado por fuerza diésel eléctrica.

Dos tipos de fuerza pueden usarse en los aparejos de perforación, cuando la consideración principal no es úna de seguridad. Se dice que en algunos casos ha habido economía usando ambas fuerzas, la de máquina de vapor y la de motor de explosión interna. La máquina de vapor resulta conveniente para el servicio del montacarga, debido a su flexibilidad. Para la propulsión de bombas y rotatorias, los motores de explosión interna ofrecen mayor economía en consumo de combustible. La instalación de una caldera para la producción de vapor para el servicio del montacarga únicamente no resulta económica, por lo general, pero mediante adecuado aislamiento, puede resultar práctica.

Un pozo profundo perforado en Alaska por la Iniskin Drilling Co., aprovechó el vapor para todos los servicios durante los dos primeros veranos de perforación. El petróleo para las calderas fué embarcado de California y transportado 6 millas por tierra hasta el punto de perforación. El tercer verano se instalaron motores diésel, para accionar las bombas de lodo y la rotatoria. El consumo de combustible fué reducido en 40% y cada servicio fué provisto de un tipo de fuerza adecuado al trabajo.

TRANSMISION HIDRAULICA

En los campos centrales y en los campos del éste de los Estados Unidos de América, el uso de aparejos de perforación provistos de motores de explosión interna, ha tenido mucha aceptación, debido a su portabilidad, economía en consumo de combustible y agua y reducción del peligro de incendio. Sin embargo, aunque las características del esfuerzo de rotación de estos motores son adecuadas a la propulsión de bombas de lodo y rotatorias, no son ideales para el trabajo de izar. La energía ideal para el servicio de montacarga es una que suministre máximo esfuerzo de rotación a velocidades bajas, como sucede con la producida por la máquina de vapor o el motor eléctrico de corriente contínua. Como los motores de explosión interna producen su máximo esfuerzo de rotación a velocidades altas, siempre se ha incluido un sistema en engranajes y un embrague eficaz, con los cuales levantar las cargas pesadas en descanzo, mientras los motores están funcionando a alta velocidad.

En estos últimos meses, se ha introducido a la práctica de la perforación un tipo de transmisión conocida bajo el nombre de convertidor hidráulico de fuerza de rotación. Su fin principal es proveer una aproximación a la flexibilidad de la fuerza de la máquina de vapor, sin sacrificar la economía en consumo de combustible del motor de explosión interna. Las transmisiones de este tipo han sido ya incluídas en la construcción de algunos automóviles, y se están aplicando ya a palas mecánicas y locomotoras de desvío provistas de motores de explosión interna.

Durante el arranque y la aceleración de grandes cargas, con el convertidor de esfuerzo de rotación, el motor funciona a velocidad normal, pero el árbol propulsor gira a una velocidad grandemente reducida. Mientras mayor es la diferencia de velocidad entre el cigüeñal del motor y el árbol propulsor o transmisor, mayor será el esfuerzo de rotación de este último, y como en el caso de la máquina de vapor, el esfuerzo de rotación llega a su máximo cuando el árbol transmisor queda completamente parado. Cuando sucede la parada, el motor continúa corriendo a velocidad normal y el esfuerzo de rotación, en el árbol transmisor, aumenta cinco veces más que el del cigüeñal del motor. La escala de velocidades del árbol transmisor es de cero a dos tercios de la velocidad del cigüeñal del motor.

El convertidor hidráulico de esfuerzo de rotación se base sobre el principio hidrocinético. Su funcionamiento depende del movimiento circulatorio del líquido para la transmisión de la fuerza. Como no hay conexión rígida entre el motor y la máquina propulsada, el líquido absorbe las cargas del choque, las variaciones cíclicas del motor y establece un arranque suave en beneficio de las cargas.

La parte hidráulica del convertidor consta de tres piezas principales: la bomba, la turbina y la tapa fija. La bomba, que está acoplada al motor, convierte la fuerza del motor en circulación de líquido, estableciendo así una presión hidráulica. La turbina, que está acoplada al árbol transmisor, convierte la presión hidráulica desarrollada por la bomba, en fuerza mecánica. La turbina consta de un rotor, en el cual van montados tres juegos de paletas separados. En la tapa fija hay dos corridas de paletas colocadas de modo que encajan exactamente entre los tres grados de la turbina.

El convertidor tiene una curva de rendimiento seguido, con máximo de 85%. Para asegurar satisfactorio funcionamiento, la mayor cantidad de trabajo debe hacerse en la escala de esfuerzo de toración y velocidad, que corresponda a un rendimiento superior a 70%. Cuando funciona continuamente bajo grandes cargas, que reducen considerablemente la velocidad del árbol transmisor, la pérdida de rendimiento produce un aumento de temperatura del líquido dentro del convertidor. Ordinariamente se emplea un radiador pequeño o cambiador de calor, para disipar el calor excesivo. La circulación por el enfriador se efectúa por presión diferencial dentro del convertidor.

Un tipo de convertidor de esfuerzo

continuously under heavy loads that greatly reduce the speed of the output shaft, the loss of efficiency causes a temperature rise of the fluid within the converter. Normally a small radiator or heat exchanger is used to dissipate this heat. Circulation through the cooler is accomplished by differential pressure within the converter.

One type of torque converter includes direct-drive mechanism that can be engaged by a clutch. In this type transmission the hydraulic drive is used for starting loads and during acceleration periods. For normal propulsion and high-speed operation the direct drive is engaged and the torque-converter parts become idle, thus making greater operating efficiency possible.

SLUSH-PUMP SUCTION

After experimenting for some time, Standard Oil Co. of California adopted the practice of using flooded suction on all slush pumps. It is reported that volumetric efficiency was greatly increased. Open rectangular tanks are used instead of pits, with vibrating screens mounted on top to remove the cuttings from the mud before it enters the tanks. An excavation is made in which the pumps are set several feet below the elevation of the tanks.

DRILL-PIPE INSPECTION

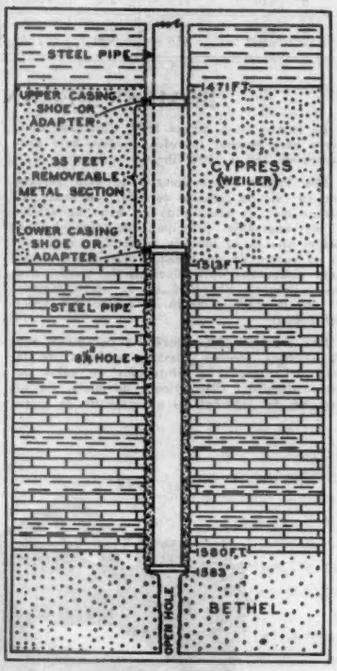
It is contended that many fishing jobs have been saved through the use of the recently introduced methods of inspecting the joints before they are run into the well. These methods include use of an instrument for examining the interior of the pipe and also the use of another instrument for checking the alignment of the pipe on the outside. With the "tuboscope," imperfections are discovered on the inside wall of the pipe before they lead to failure. Checking the straightness of the pipe on the derrick floor is now easily accomplished; and hydraulic drill-pipe or kelly straighteners are often kept at each location in order to discourage the use of faulty joints.

Some time ago the fluid passages drilled through drill collars were quite commonly off center. Operators especially interested in drilling straight holes discovered that the unbalanced condition of such drill collars in rotation tended to misguide the bit. Drill collars are now manufactured with equal wall thickness on all sides.

DRILLING-TIME RECORDERS

Use of drilling time as a basis for determination of stratigraphic change has become an established principle in rotary drilling. For some time diagrams have been made in certain fields in order to record the time required to drill each interval in the productive section of the hole. Properly kept records of drilling speed can be used for the following purposes:

1. Since porous formations drill more readily than nonporous formations, the drilling-time curve helps the operator to recognize the porous oil-bearing formations. In areas where limestone is productive, drilling-time data have been used extensively because productivity is usually related directly to porosity, and without such data the operator may be unable to determine what



Removable sections of casing are used in fields where there are two production sands present. After the casing has been cemented, the section is removed to expose the upper sand

Se emplean secciones de tubería amovible, en campos donde existen dos capas de arena petrolífera. Después de cementada la tubería de revestimiento, se quita la sección, para exponer la capa superior de arena petrolífera

portion of the limestone formation is most productive.

2. When samples of cuttings are used for correlation purposes, there is always uncertainty as to how much time was required for the cuttings to be circulated out of the hole. Drilling-time data furnish a check against sample-log data so that proper corrections can be made.

3. Since changes from hard to soft formations, or vice versa, are easily recognized, drilling-time curves furnish a practical means of correlating from well to well where formations are continuous. Usually such data are used in conjunction with other available log data.

MECHANICAL RECORDER

Recording drilling time manually has been quite successful, but the human element is allowed to enter into the accuracy of the data, and the absence of pertinent facts may

de rotación incluye un mecanismo de propulsión directa, que puede conectarse mediante un embrague. En este tipo de transmisión, la propulsión hidráulica se usa para el arranque de cargas y durante los períodos de aceleración. Para la propulsión normal y funcionamiento a alta velocidad, la propulsión directa queda conectada y las piezas del convertidor quedan sin trabajar, lo cual hace posible un mayor grado de rendimiento efectivo.

ASPIRACION DE BOMBA DE LODO

Después de numerosos experimentos, la Standard Oil Co. of California adoptó la práctica de usar succión en todas las bombas de lodo. Se dice que el rendimiento volumétrico fué así aumentado grandemente. Se emplean tanques rectanguladores destapados, en lugar de hoyos, con coladores o cedazos vibratorios montados en la parte superior, para quitar los desperdicios del lodo, antes de su entrada a los tanques. Se hace una excavación, en la cual se colocan las bombas varios piés debajo de la altura de los tanques.

INSPECCION DE LA TUBERIA DE PERFORACION

Se asegura que se han evitado numerosos trabajos de pesca o recuperación, gracias al uso de un nuevo método de inspección de las uniones o juntas, antes de meterse en el pozo. Este método, de reciente introducción, comprende el empleo de un instrumento para examinar el interior de la tubería y también la utilización de otro instrumento para rectificar la alineación exterior de la tubería. Con el instrumento llamado tuboscopio, se descubren las imperfecciones en la pared interior de la tubería, antes de que ellas provoquen irregularidades. La rectificación de la rectitud de la tubería en el piso de la torre se efectúa ahora con facilidad. Enderezadores o rectificadores de tubería de perforación y juntas kelly se hallan, a menudo, a mano en cada instalación, para evitar el uso de juntas defectuosas.

Hasta hace poco, los conductos de líquido perforados en los collares de perforación, quedaban, en muchos casos, descentrados. Los explotadores interesados especialmente en perforar agujeros rectos descubrieron que el desvío en la perforación de los collares, tendía, durante la rotación, a desviar también la barrena. Los collares de perforación se hacen ahora con igual espesor de pared en todos los lados.

REGISTRADORES DE TIEMPO DE PERFORACION

El uso del tiempo de perforación, como una base para la determinación de cambios estratigráficos, ha llegado a ser práctica establecida en la perforación con equipo rotatorio. Desde hace cierto tiempo, en ciertos campos se han hecho diagramas cronológicos, para llevar cuenta exacta del tiempo empleado en perforar cada intervalo en la sección productiva del pozo. Los registros bien hechos de velocidad de perforación pueden usarse para los fines siguientes:

1. Como las formaciones porosas se perforan con mayor facilidad que las no porosas, la curva de tiempo de perforación ayuda al ingeniero a reconocer las formaciones petrolíferas porosas. En campos de caracter calizo productivo, se han empleado ventajosamente los datos de tiempo de perforación, a causa de que la productividad está generalmente conectada, de una manera directa, con la porosidad. El perforador, sin la ayuda de semejantes datos, no podrá determinar qué parte de la formación caliza es la más productiva.

2. Cuando muestras de cortaduras o núcleos se usan para los fines de correlación, siempre existe la incerteza de qué tiempo se ha requerido para que semejantes cortaduras floten afuera del pozo. Los datos de tiempo de perforación sirven para rectificar los datos del informe diario de la perforación y muestras, facilitando mucho la corrección de estos últimos.

3. Como los cambios de formaciones de duras a blandas, o vice versa, se reconocen con facilidad, las curvas de tiempo de perforación suministran un medio práctico para la correlación de pozo a pozo, donde las formaciones son contínuas. Generalmente, semejantes datos se usan en combinación con otros sacados del informe diario de la perforación.

REGISTRADOR MECANICO

El registro del tiempo de perforación, por método manual, ha sido bastante satisfactorio, pero el elemento humano queda libre para entrar en la exactitud de los datos y la ausencia de informes pertinentes puede grandemente disminuir el valor práctico de los datos. La reciente introducción del instrumento llamado "geológrafo" hace automático el registro de la velocidad de perforación e intervalos de parada.

Para el funcionamiento, se conecta un alambre flexible al cuello de ganso del acoplador giratorio, pasándolo por una polea colocada como a 50 piés de altura sobre el piso de la torre, y de acquí, pasándolo por el geológrafo y otra polea. Del extremo libre del alambre se suspende un peso, para mantener estirado o tieso el alambre. De esta manera, los movimientos verticales del vástago de perforación se transmiten por el instrumento.

En el mismo instrumento, el alambre flexible da movimiento a una rueda provista de excéntricas, las cuales hacen contacto con una pluma registradora, cada vez que la tubería de perforación es bajada un

GASO PUMP & BURNER MFG.

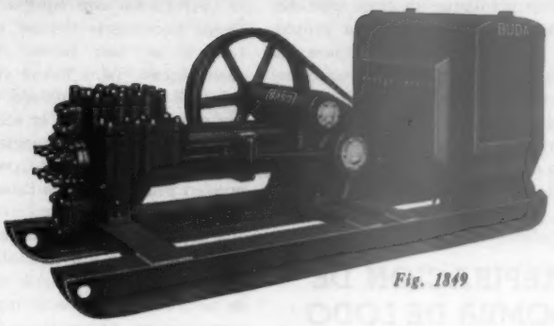


Fig. 1849

SERIES 1800—POWER PUMPS

GASO Figure 1849 Pump is adaptable for any service such as water lines, gathering systems, booster stations, or acidizing. Light in weight, compact and complete, it is ideal to meet conditions in declining fields or on smaller leases. Pump is illustrated with gas or gasoline engine drive.

The same features will be found in this pump as in models of much higher price. Crankcase is enclosed and provides a reservoir for holding oil bath which lubricates the gears, crossheads and connecting rod bearings. Main and pinion bearings are Timken Tapered Roller Bearings, enclosed in cast iron housings and sealed off from crankcase. Timken bearings are oiled from outside, one filling sufficing for months of steady operation.

Fluid ends are interchangeable liner type. We can furnish special alloy steel liners or bronze liners for specific service; also all-acid-resisting-bronze fluid end for acid service. Pump can be arranged for any type drive. Cylinder sizes 2½x6 to 4x6.

FIGURE 1844 and 1849

Size	DISPLACEMENT		Pounds Working Pressure	R.P.M.	Pipe Size		Pump Fig. No.
	Gallons Per Min.	Barrels per Hr.			Suc., In.	Dis., In.	
2½x6	32	46	900	70	4	2	1844-1849
3 x6	47	67	600	70	4	2	1844-1849
3½x6	65	93	450	70	4	2	1844-1849
4 x6	88	126	350	70	4	2	1844-1849

BOMBAS MECANICAS—SERIE 1800

La bomba GASO, según la figura 1849, se adapta a cualquier servicio, como conductos de agua, sistemas colectores, estaciones de amplificación y trabajos de tratamiento por ácido. Liviana en peso, compacta y completa, resulta ideal para los campos en declinación o las pequeñas concesiones. La bomba está ilustrada con motor de gas como con motor de gasolina.

En esta bomba se presentan las mismas características que se ofrecen con los modelos más caros. La caja del cigüeñal está cerrada y provee un depósito para un baño de aceite, que sirve para lubricar los engranajes, cabezales y cojinetes de bielas. Los cojinetes del cigüeñal y de los piñones son de rodillos cónicos Timken, protegidos en cajas de hierro fundido y aislados de la caja del cigüeñal. Los cojinetes Timken reciben lubricación exterior, bastando una carga de lubricante para varios meses de contínuo trabajo.

Los extremos de líquido son del tipo de manguito o camisa intercambiable. Podemos suministrar maguitos de especial aleación de acero o manguitos de bronce, para servicios especiales; también ofrecemos extremos de líquido de bronce resistente al ácido, para trabajos de ácido. La bomba puede acondicionarse a cualquier tipo de propulsión. Tamaños de cilindro de 2½x6 a 4x6 pulgadas; capacidades de 46 a 126 barriles por hora.

Fig. 1550

SERIES 1500—POWER PUMPS

Gaso Figure 1550 Pump, here shown, is designed to pump oil or water under pressures of from 150 to 1000 pounds.

Outstanding features of this model are its enclosed crankcase, with all working parts operating in a bath of oil, and its main gear of herringbone design, a semi-steel casting mounted in the center on a heavy steel crankshaft, to evenly distribute load on the bearings. Pinion is a steel forging and is also mounted at the center of pinion shaft.

Main and pinion bearings are Timken Tapered Roller sealed off from crankcase, enclosed in cast iron housings. Connecting rod bearing at crank end is a steel shell, genuine babbitt lined, and can be replaced.

The fluid end is cast of Molybdenum-alloy iron. It can be furnished with cast iron removable liners or with bronze-lined liners of removable type. Fluid ends for Figs. 1507, 1508 and 1509, also 2017, 2018 and 2019, are interchangeable on this power frame. Fig. 1550 is here shown with side pot type fluid end, interchangeable liner type.

Pumps can be arranged for any type drive: (1) Pulley for belt drive, (2) direct connected to engine through flexible coupling, (3) electric motor through chain or reduction gears, (4) "V" Belt drive to electric motor or multiple cylinder power unit.

FIGURE 1507-1508-1509 and 1550

Size Pump	DISPLACEMENT		Working Pressure	R.P.M.	Pipe Size		Pump Fig. No.
	Gal. per Min.	Bbl. per Hour			Suc.	Dis.	
2½"x10"	41	59	1000	54	4"	3"	1508-1509-1550
3" x10"	61	87	800	54	4"	3"	1508-1509-1550
3½"x10"	85	122	600	54	4"	3"	1508-1509-1550
4" x10"	113	161	450	54	4"	3"	1508-1509-1550
4½"x10"	144	205	350	54	4"	3"	1508-1509-1550
5" x10"	179	255	300	54	4"	3"	1508-1509-1550
6" x10"	259	371	200	54	6"	4"	1507
7" x10"	355	508	150	54	6"	4"	1507

BOMBAS MECANICAS—SERIE 1500

La bomba Gaso, figura 1550, ilustrada aquí, sirve para bombar petróleo o agua, bajo presiones de 150 a 1000 libras.

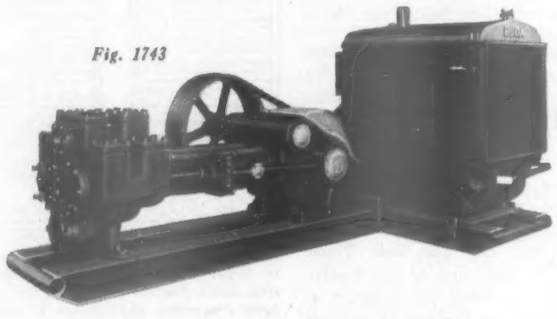
Los rasgos sobresalientes de este modelo son su caja de cigüeñal cerrada, con todas las piezas móviles trabajando en baño de aceite, y su engranaje principal, de tipo helical doble, una pieza fundida de semiacero montada al centro de un pesado cigüeñal de acero, para compensar uniformemente la carga entre los cojinetes. El piñón es de acero forjado y está montado también al centro del árbol del piñón.

Los cojinetes del cigüeñal y del piñón son de rodillos cónicos Timken, aislados de la caja del cigüeñal y protegidos en cajas de hierro fundido. El cojinete de biela, en el extremo del cigüeñal, es un casquillo de acero con forro de metal babbitt, de tipo renovable.

El extremo de líquido es de aleación de hierro y molibdeno fundida. Puede suministrarse con manguitos amovibles de hierro fundido o con manguitos forrados de bronce, de tipo amovible. Los extremos de líquido de los modelos, según las figuras 1507, 1508 y 1509, lo mismo que los de las figuras 2017, 2018 y 2019, son intercambiables en estos modelos. La figura 1550 se muestra aquí con extremo de líquido de tipo lateral y manguito de tipo intercambiable.

Las bombas pueden prepararse para cualquier tipo de transmisión: (1) poleas para transmisión por correa, (2) conexión directa al motor mediante acoplamiento flexible, (3) cadena o engranajes reductores para motor eléctrico, (4) correa transmisora en "V" a motor eléctrico o motor multicilíndrico.

Fig. 1743



SERIES 1700—POWER PUMPS

These pumps are designed to pump oil or water through long lines at pressures from 300 to 1400 pounds. Are admirably suited for pumping extremely large capacities at high pressures, having fluid ends with interchangeable liners from 2½" to 5" and from 5" to 7½" x 10" stroke. Figure 1743 shows the pump with Combination Gas and Gasoline Engine drive.

These pumps possess all of the recognized GASO features. Crankcase is fully enclosed, and working parts operate in oil bath. Both pinion and crankshafts are journaled in Timken Tapered Roller Bearings of exceptionally large size and sealed off from the crankcase. Fluid ends can be furnished with special alloy steel liners, chromonized, or cast iron liners, bronze lined. All pumps are standard brass fitted, with steel piston rods. We can furnish any type of valve construction required for particular conditions. Pumps can be arranged for any type drive: (1) Pulley for belt drive, (2) direct connected to engine through flexible coupling, (3) electric motor through chain or reduction gears, (4) "V" Belt drive to electric motor or multiple cylinder power unit. Capacities 54 to 578 barrels per hour.

FIGURE 1740-1741-1742 and 1743

Size Pump	DISPLACEMENT		Working Pressure	R.P.M.	Pipe Size		Pump Fig. No.
	Gal. per Min.	Bbl. per Hr.			Suc.	Dis.	
2½"x10"	38	54	1400	54	4"	3"	1740-1742
3" x10"	57	82	1400	54	4"	3"	1740-1742
3½"x10"	81	116	1200	54	4"	3"	1740-1742
4" x10"	109	156	925	54	4"	3"	1740-1743
4½"x10"	140	200	725	54	4"	3"	1740-1743
5" x10"	175	250	600	54	4"	3"	1740-1743
5" x10"	175	250	600	54	6"	4"	1741-1743
5½"x10"	213	305	500	54	6"	4"	1741-1743
6" x10"	255	365	400	54	6"	4"	1741-1743
6½"x10"	301	431	350	54	6"	4"	1741-1743
7" x10"	351	502	300	54	6"	4"	1741-1743
7½"x10"	405	578	260	54	6"	4"	1741-1743

Export Office: 149 Broadway, New York, N. Y.

greatly decrease the value of the data. The recent introduction of the "geolograph" makes the recording of drilling speed and shut-down intervals automatic.

In operation, a flexible wire line is connected to the goose neck of the rotary swivel, passed through a sheave about 50 ft. above the derrick floor, thence down through the geolograph and back up over a second pulley. A weight is suspended on the free end of the line to keep the wire taut. In this manner the vertical movements of the drill stem are transmitted through the instrument.

In the instrument the flexible wire actuates a wheel that is fitted with cams which contact a recording pen each time the drill pipe is lowered 1 ft. As the chart is rotated by the clockwork this pen records a continuous vertical line until contact with a cam throws it out of line, thus making a horizontal mark. The distance between any two of these marks represents the time required to drill that particular foot of formation.

Time consumed by round trips or for circulating, or for any duties other than drilling ahead, is recorded by another principle incorporated in the same instrument. A magnet is suspended above the wheel described. This magnet is responsive to the direction of motion of the wheel. An upper extension of the magnet arm carries a second pen which records these movements on another column of the same chart. When drilling is in progress the wheel's direction of rotation is always the same, and the pen records continuously at the left of the zero line. When the bit is raised off bottom the direction reversal causes the pen to move to the right of the zero line.

HYDRAULIC RECORDER

A simpler type of drilling-time recorder operates by a fluid-pressure principle. Known as the rate-of-penetration recorder, this instrument consists of a long flexible tube with a fluid reservoir at the top which is fastened to the rotary swivel. A recording pressure gage at the other end is mounted at any convenient point a few feet above derrick-floor level. As the drill stem progresses downward the height of the fluid column acting against the pressure recorder decreases, and this decrease is shown in feet of penetration on the chart. The chart is rotated by clockwork and marked off in hours and minutes so that the rate of penetration is easily read. Time spent in making round trips, or in performing other operations, is also indicated on the chart.

CABLE-TOOL DRILLING

Few changes have been made in cable-tool drilling practice in recent years. Probably the most outstanding development has been the perfection during the past year of a dynamometer that makes it possible to select the most suitable stroke.

It is reported by the Drilling Practice Committee of the A.P.I., eastern division, that drilling time was reduced in one West Virginia field from an average of 55 days per 3,000-ft. well to 30 days through the use of the dynamometer. After a study of the dynamometer cards, the following summary was made:

"All cable-tool drillers involved drilled with too tight a hitch. It has been the usual practice to select a hitch that would show the greatest reaction at the surface; that is, one that would make the most noise and jar the derrick most. The increased drilling time was arrived at by taking what drillers termed a loose hitch and increasing it by 4 or 5 ft."

It is believed that more work in this direction will prove beneficial to operators drilling deep cable-tool wells. However, it is possible that in studying the effects of a looser hitch, a study of hole vertically should be carried on simultaneously.

In the last few months several tests have been made for hole straightness during cable-tool drilling, and it has been found that crooked holes are not confined to rotary drilling. Also it appears that the cable-tool driller is able to prevent crooked holes or to direct crooked holes back to the vertical by proper adjustment of the stroke of the tools. Thus it appears that the cable-tool driller should be provided with frequent deviation tests if he is to select the optimum stroke for drilling speed.

One concern has found that the use of vertical-test instruments is admirably suited for cable-tool drilling. The instrument can be run in a special container which is welded inside of the bailer. Since the bailer is run frequently, plenty of opportunities are available for tests. All that is necessary is to leave the bailer motionless at the bottom of the hole for a few minutes.

In rotary drilling it has become usual practice to use both the weight indicator and the vertical-test instrument in order to select the conditions that will make for faster drilling without deflecting the hole. It now seems probable that the dynamometer and the deviation tester will be used side by side to accomplish the same purpose in cable-tool drilling.

CASING FAILURES

Several operators have noticed an increase in casing failures since straight-hole drilling has become established. These failures usually occur in wells more than 7,000 ft. deep where casing was cemented only for a short interval at the bottom. Such failures have been attributed variously to two causes:

First, it is believed that casing set in a straight hole is more susceptible to destructure by vibration, because

(Continued on Page 220)

pié. Como la cartilla es girada por un mecanismo de reloj, esta pluma registra una línea vertical contínua, hasta que el contacto con la excéntrica la desvía produciendo una marca horizontal. La distancia entre dos de estas marcas representa el tiempo requerido para perforar un pié de esa formación particular.

El tiempo consumido en completo viaje de bajada y subida, en circulación y otros trabajos, que no sean los de perforación progresiva, queda registrado mediante otro mecanismo, basado sobre distinto principio, incluído también en el instrumento. Arriba de la rueda ya descrita se suspende un imán. Este imán responde a la dirección del movimiento de la rueda. Una extensión superior del brazo del imán lleva una segunda pluma, que anota estos movimientos en otra columna de la misma carti-

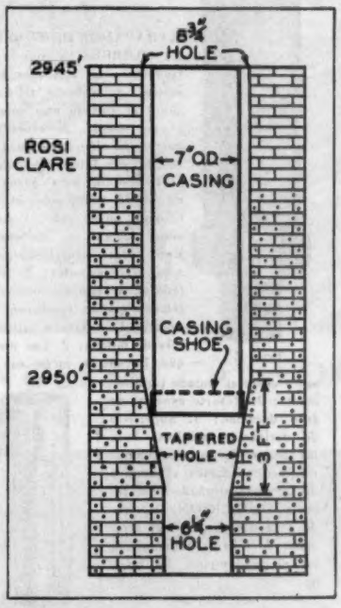


Diagram of tapered casing seat, showing how the large and small holes are aligned

Diagrama del asiento cónico de la tubería de revestimiento, en el cual se observará la alineación entre el agujero grande y el pequeño

lla. Mientras se está perforando, la dirección de la rotación de la rueda es siempre la misma, y la pluma registra continuamente a la izquierda de la línea de cero. Cuando la barrena se levanta del fondo, la inversión de su dirección hace que la pluma se mueva hacia la derecha de la línea de cero.

REGISTRADOR HIDRAULICO

Un tipo más sencillo de registrador de tiempo de perforación funciona sobre el principio de la presión líquida o hidráulica. Conocido bajo el nombre de registrador de régimen de penetración, este instrumento consta de un largo tubo flexible con un depósito de líquido en su parte superior, el cual se une al acoplador giratorio. Un manómetro indicador de presión, en el otro extremo, se monta en cualquier punto conveniente, unos pocos piés arriba del nivel del piso de la torre. A medida que desciende el vástago de perforación, se reduce la altura de la columna líquida, que actúa sobre el registrador de presión, y esta reducción queda anotada en piés de penetración, en la cartilla. La cartilla es girada por un mecanismo de reloj y lleva graduaciones en horas y minutos, a fin de facilitar la lectura del régimen o rapidez de la penetración. El tiempo consumido en las completas bajadas y subidas y otras maniobras, queda también anotado en la cartilla.

PERFORACION CON HERRAMIENTA DE CABLE

Pocos cambios se registran en la práctica de la perforación con herramienta de cable, estos últimos años. Probablemente el desarrollo más sobresaliente ha sido el perfeccionamiento, durante el año pasado, de un dinamómetro, que permite elegir la carrera más adecuada.

El Comité de Práctica de Perforación (Drilling Practice Committee) del Instituto Americano de Petróleo (A.P.I.) división del éste, informa que en un campo de West Virginia, se redujo el tiempo de perforación, de un promedio de 55 días por 3.000 piés de pozo, a 30 días, gracias a la ayuda del dinamómetro. Después de estudiar las tarjetas del dinamómetro, se hizo el sumario siguiente:

"Todos los perforadores comprendidos en este trabajo con herramienta de cable, perforaban con una carrera demasiado fuerte. La práctica corriente era elegir una carrera que produjera la mayor reacción posible en la superficie, es decir, una que hiciera el mayor ruido y percusión en la torre. Se logró el aumento de tiempo haciendo, lo que los perforadores, llaman una carrera suelta y aumentándola de 4 a 5 piés."

Se cree que más trabajo en este sentido seultará en beneficio para los perforadores que trabajan pozos profundos con la ayuda de herramientas de cable. Sin embargo, es posible que al estudiar los efectos de una carrera más suelta, se lleve también a cabo, simultaneamente, un estudio de la verticalidad del agujero.

Estos últimos meses, se han realizado varios ensayos de la rectitud del agujero durante la perforación con herramienta de cable, y se ha visto que los agujeros ladeados o torcidos no se confinan a la perforación con rotatoria. También se ha visto que el perforador con herramienta de cable puede evitar los agujeros ladeados o rectificarlos, devolviéndolos a la vertical, mediante un correcto ajuste de la carrera de las herramientas. Esto, por lo tanto, quiere decir que el perforador con herramienta de cable debe también hacer frecuentes ensayos de desviación, si pretende elegir la carrera más con-

(Continue en Pagina 220)

THE GUIBERSON CORPORATION

Dallas, Texas, U. S. A.

Maracaibo — Export Office: 30 Rockefeller Plaza, New York, N. Y. — Trinidad

GUIBERSON SWABS

Patented

The GUIBERSON Swab is the only swab constructed on the correct principle, flexible cups yielding to by-pass fluid and obstructions running in, but being pressed tight against pipe by fluid pressure, coming out. Advantages: 1. Raises full loads; 2. Cups yield to pass projections and paraffin—will not stick; 3. Runs in faster; 4. Special composition cups protected by steel wires, wear longer; 5. Less wear on tubing and casing.

ESCOBILLONES GUIBERSON

Patentados

El escobillón GUIBERSON es el único escobillón construído según principio correcto, con las tazas o cubetas flexibles cediendo al líquido en derivación y a las obstrucciones entrantes, pero firmemente cerradas contra el tubo, por la presión del líquido saliente. Ventajas: Aumenta las cargas totales; 2. Las tazas ceden para dejar pasar partículas y la parafina; no se pueden atascar o trabar; 3. Se introduce más rápidamente; 4. Las tazas de composición especial y protegidas por alambres de acero, duran mucho más; 5. Menos desgaste sobre la tubería y el revestimiento.

SUCKER ROD STRIPPER

Patent Pending

The GUIBERSON perfected Sucker Rod Stripper provides a positive seal against escape of oil and gas, when running in or pulling rods. Strips paraffin as well as oil from rods and couplings. Specially developed rubbers are long-lived. Two sizes of rubbers handle all sizes of rods.

DESGARRADOR DE VARILLAS DE ASPIRACION

Patente pendiente

El desgarrador de varillas de aspiración perfeccionado GUIBERSON asegura un cierre seguro contra el escape de petróleo y de gas, cuando se descienden o se levantan las varillas. Desgarra o quita toda la parafina y el petróleo de las varillas y de los acoplamientos. Las piezas de caucho de tipo perfeccionado son muy durables. Dos tamaños de piezas de caucho se adaptan a todos los tamaños de varilla de aspiración.

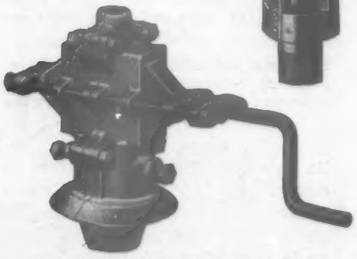
TUBING CATCHERS

Type E

GUIBERSON introduced the automatic tubing catcher and offers the world's most complete and highly perfected line. Type E is for wells of any depth—Type B for wells under 4,000 feet—Type C for wells with faulty or thin casing. A few advantages: 1. Slips of larger and ample size operate accurately on dovetail tracks; 2. Load-Carrying parts are heat-treated alloy steel; 3. Special non-fatiguing spring; 4. Largest by-pass area. In pumping wells we recommend use of GUIBERSON Tubing Catcher Anchor, shown at right below, with catcher, for increased pumping efficiency.

ATRAPADOR DE TUBERIA

La GUIBERSON fué la introductora del atrapador automático de tubería y ofrece ahora el surtidó más completo del mundo, de estos productos. El tipo E es para pozo de cualquier profundidad —el tipo B, para pozos de menos de 4.000 piés—el tipo C, para pozos con revestimiento delgado o defectuoso. Entre otras ventajas citamos aquí las siguientes: 1. Sujetadores de tamaño convenientemente grande funcionan con seguridad en vías a estilo de cola de milano; 2. Las piezas que llevan la carga son de acero especial tratado térmicamente; 3. Resorte especial de gran duración; 4. Superficie de derivación máxima. Para los pozos de corriente natural, recomendamos el empleo de la ancla atrapadora de tubería GUIBERSON, mostrada a la derecha, con el atrapador de tubería, para aumentar el rendimiento del bombeo.



WIRE LINE OIL SAVER

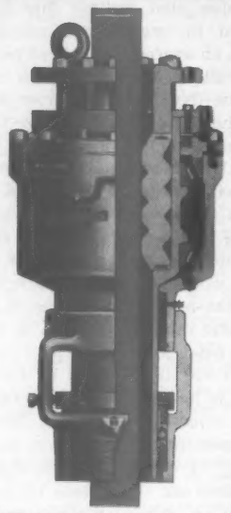
Patented

The GUIBERSON Wire Line Oil Saver is the outstanding device of its kind. Its patented method of adjusting both rubbers simultaneously and uniformly by turning one crank insures equalized pressure and uniform wear on rubbers. 500 pounds test. Easiest to operate. Perfected in every detail.

ECONOMIZADOR DE PETROLEO PARA CABLE

Patentado

El economizador de petróleo GUIBERSON para cable es el aparato más notable de su clase de hoy día. Su método patentado, que regula las dos piezas de caucho simultánea y uniformemente, girando una manivela, asegura una presión compensada y un desgaste uniforme en las piezas de caucho. Ensayado a 500 libras. Operación sumamente fácil. Perfeccionado en todo sentido.



TYPE "E" DRILLING HEAD

Patent Pending

The new GUIBERSON Type "E" Drilling Head, Blow-out Preventer, and Stripper is the ideal head for drilling in wells under controlled pressure with square or round kelly. It is also highly recommended for running tubing under pressure. It meets the long felt need for a leak-proof rotating pack-off between kelly or drill pipe and casing. The packing medium rotates with the kelly, thus eliminating wear on packing while drilling. Packing medium is designed so that it will pack off around any standard kelly up to 4-1/4", and around any size tubing and drill pipe up to a maximum O. D. of 5-3/4".

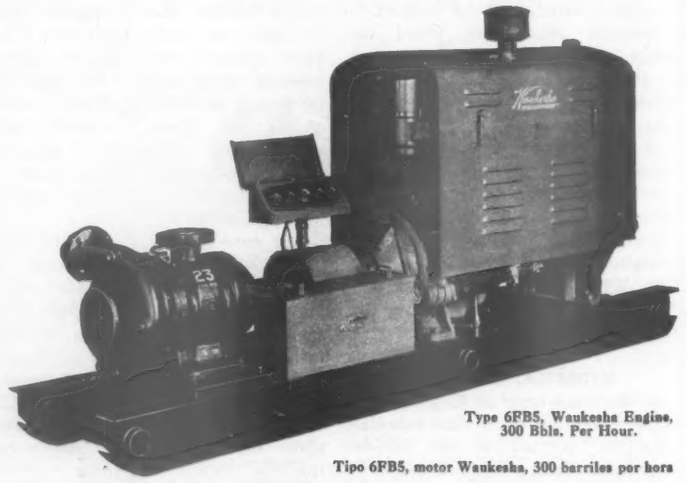
Tested to 3,000 lbs. Recommended for working pressures up to 1,500 lbs.

TIPO "E" CABECERO O CABEZA DE PERFORACION

(Patente pendiente)

El nuevo tipo "E" de cabecero de perforación, aparato para evitar las explosiones y desgarrador, de marca GUIBERSON, es la cabeza ideal para la perforación de pozos bajo presión controlada con kelly rectangular o cilíndrico. Se recomienda también mucho para el manejo de tubería bajo presión. Satisface la necesidad, desde hace tiempo sentida, de un tapón entre el kelly o tubo de perforación y la tubería. El elemento obturador gira con el kelly, eliminando el desgaste de la empaquetadura durante la perforación. El elemento obturador está proyectado para actuar sobre cualquier kelly normal hasta de 4¼" y sobre cualquier tamaño de tubería hasta de 5¾" de diámetro exterior.

Ensayado a 3.000 lbs. Recomendado para presiones de trabajo hasta de 1.500 lbs.



Type 6FB5, Waukesha Engine, 300 Bbls. Per Hour.

Tipo 6FB5, motor Waukesha, 300 barriles por hora

NEW GUIBERSON ROTARY HIGH-PRESSURE PUMP

Patented

The new GUIBERSON Rotary High-Pressure Pump meets the demand of oil field engineers for a pump with high efficiency over a wide range of speeds and pressures, for gathering and pipe line service. Like all Guiberson products, this pump was given the test of actual field service before it was offered to the industry. A type FB8 Pump has been in gathering line service for the past 4 years, and the record made may be checked by anyone interested.

Among the advantages of this pump are: 1. Direct drive by motor or engine, without gears; 2. Fewer wearing parts; 3. Less packing; 4. Adaptable for gasoline or Diesel engine, or electric motor drive; 5. High efficiencies up to 1000 lbs. or more; 6. Operation at sustained high speed; 7. Non-pulsating discharge; 8. No trapping.

BOMBA ROTATIVA DE NUEVO TIPO GUIBERSON DE ALTA PRESION

(Patentada)

La nueva bomba rotativa GUIBERSON de alta presión satisface la demanda de los ingenieros de pozos de petróleo por un modelo de gran rendimiento dentro de una amplia escala de velocidades y presiones, para servicio de recolección y transmisión por tuberías. Como todos los productos Guiberson, esta bomba fué sometida a trabajo práctico en campos petrolíferos antes de ser ofrecida a la industria. Un tipo de bomba FB8 ha estado al servicio de tubería de recolección desde hace 4 años y su trabajo será explicado en detalle a cualquier interesado.

Entre las ventajas de esta bomba citamos las siguientes: 1. transmisión o propulsión directa por motor, sin la intervención de engranajes; 2. Menos piezas sujetas a desgaste; 3. Menos empaquetadura; 4. Adaptada a motor de gasolina o diésel de petróleo, o bien, a motor eléctrico; 5. Grandes rendimientos hasta 1.000 lbs. o más; 6. Funcionamiento a alta velocidad contínua; 7. Descarga sin pulsación; 8. Ninguna retención o impedimento.

Write for complete new catalog, or other specific information.

& SUCKER RODS

MEET *ALL* PUMPING CONDITIONS

STANDARDS OF QUALITY...

LOS ANGELES, CALIFORNIA — FACTORY

ABOVE—Axelson Pumps are made in this modern factory at Los Angeles. This plant is fully equipped with the highly specialized modern machinery, gages, and testing devices essential to the manufacture of oil well pumps of uniform high quality.

ARRIBA—Las Bombas Axelson se manufacturan en esta fábrica de última construcción el Los Angeles. Dicha Planta está equipada totalmente con maquinaria especial moderna de la más alta calidad, así como con manómetros y medios de prueba que resultan ser esenciales en la manufactura de bombas para pozos de petróleo, de calidad primera y uniforme.

RIGHT—Axelson Sucker Rods are produced in this plant at St. Louis. Axelson engineers and metallurgists have available every facility for research that may further improve the quality of their sucker rods.

A la DERECHA—Las Varillas Aspiratorias Axelson se fabrican en esta planta de San Louis. Los ingenieros y metalurgicos de la Compañia Axelson tienen a su disposicion todas las facilidades para el constante estudio en este campo a efecto de mejorar siempre más la calidad de sus Varillas Aspiratorias.

ST. LOUIS, MISSOURI — FACTORY

AXELSON MANUFACTURING CO., P. O. BOX 98, Vernon Station, Los Angeles • St. Louis • 50 Church Street, New York • Tulsa • *Mid-Continent and Eastern Distributor:* Frick-Reid Supply Corp. • *Rocky Mountain Distributor:* Great Northern Tool & Supply Co. • *Foreign Representatives:* "COSMOS" Soc. In Nume Colectiv, Bucharest, Roumania. • *Direct Factory Representative,* Bucharest, Roumania • Industrial Agencies, Ltd., San Fernando, Trinidad, British West Indies • *Factory Representative,* Maracaibo, Venezuela • *Direct Factory Representative,* Buenos Aires, Argentina.

AXELSON

the dampening effect that would be furnished by a crooked hole is absent. Severe vibrations may be set up when the drill pipe is rotated inside of the casing, unless the entire string of casing is cemented.

Second, when a long string of casing is suspended in a deep well, the factor of safety for the top joint in tension is often less than two. Under tension the pipe stretches, and this elongation is increased by high earth temperatures and by the heat of reaction between water and cement.

After the cement sets, the top joint of casing continues to carry its original load in tension. If for any reason a reduction in temperature should occur either inside or outside of the casing, the resulting contraction of the pipe may prove destructive, thus leading to a difficult and expensive repair job.

Reduction in temperature inside of the casing commonly takes place shortly after the cement sets. Cold mud may be pumped into the hole. In one case this factor alone was enough to part the casing before rotation of the drill stem was started. Other failures have occurred after wells have been placed on production, and were supposedly caused by the low temperatures resulting from rapid expansion of formation gas.

Vibrations caused by rotation of the drill pipe would naturally be most destructive when the casing was under the severe tension resulting from the conditions described above. Possibly vibrations in this case are less destructive than common whipping of the drill pipe.

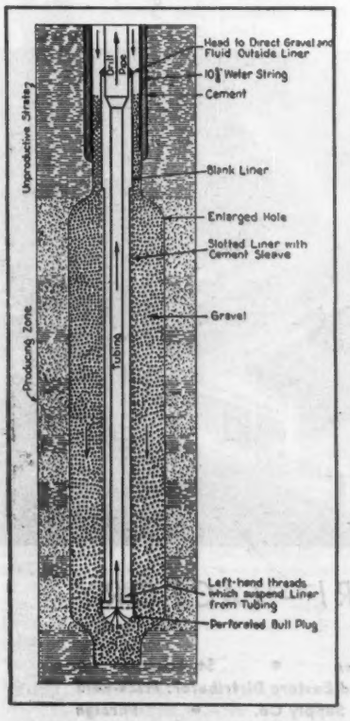


Diagram showing method used in suspending the perforated liner while gravel is packed around it. Arrow indicates course of the gravel-placing fluid

En este diagrama mostramos el método de suspender la tubería perforada, mientras se empaca grava a su alrededor. La flecha indica la dirección del líquido colocador de la grava

Casing failures of the type described are being prevented by three methods of attack:

1. Letting off tension on top joints of casing.
2. Using round threads on the casing.
3. Cementing a larger portion of the string.

In following the first method care should be taken to avoid letting off too much tension and thus putting the uncemented portion of the string in tension. On Page E-2 of The Drilling Equipment Directory all necessary data are given for determining the proper distance that the top joint of casing should be lowered after the cement has set.

The second method has met with success, because a round thread offers less opportunity for concentration of forces than does a V thread. Round threads are especially successful where it is necessary to contend with vibrational forces.

Chances for casing failures are always diminished when more cement is placed behind the pipe, and they are almost certain to be eliminated entirely if the entire string is cemented.

ELECTRIC LOGGING

The first commercial application of electric logging consisted solely of an intermittent resistivity curve obtained by taking readings every 5 ft. An early improvement was the continuous recording of the same resistivity curve. This step was followed by the introduction of the self-potential or porosity diagram with continuous recording of both first and second curves.

Experience disclosed certain limitations of the first two curves, self-potential and resistivity, especially for the determination of fluid content of formations. During the drilling of a well the water from the mud invades the porous formations to some extent. If the depth of investigation of the exploring device is less than the depth invaded, the resistivity readings obtained are not related to the true resistivity of the formations, but are actually readings for the water-invaded sands.

By increasing the distance between the electrodes the depth of investigation is increased during electric logging. Thus the effects of invasion can be eliminated. Experimental work has been carried on to determine depths of investigation necessary to overcome the influences of invasion. As a result it is now the usual practice to record three curves simultaneously. The first is the self-potential or porosity curve. The second is the normal resistivity curve, having a depth of investigation of about 3 ft. Its function is to define the formations and to indicate tops and bottoms of all resistive beds whose thickness exceeds 1½ ft. Its limitation is that it yields a doubt-

(Continued on Page 225)

veniente para la velocidad de la perforación.

Una empresa ha visto que el uso de instrumentos de ensayo vertical es admirablemente adecuado a la perforación con herramienta de cable. El instrumento puede correrse en una caja especial, soldada el interior del achicador. Como el achicador se corre con frecuencia, se presentan entonces muchas oportunidades para efectuar el ensayo. Todo lo que es necesario hacer es dejar sin movimiento el achicador al fondo del pozo, por algunos minutos.

En la perforación con rotatoria, la práctica corriente es usar tanto el indicador de peso como el instrumento de ensayo vertical, a fin de elegir las condiciones que sean más ventajosas para la perforación más rápida, sin torcer el agujero. Parece ahora probable que el dinamómetro y el ensayador de desviación se usarán juntos para realizar el mismo fin en la perforación con herramienta de cable.

FALLAS DE LA TUBERIA

Varios perforadores han observado un aumento en las fallas de la tubería, a continuación de la introducción de la perforación de agujero rectilíneo. Estas fallas ocurren generalmente en pozos de más de 7.000 piés de profundidad, donde la tubería ha sido cementada sólo por corto intervalo al fondo. Semejantes fallas han sido atribuidas, en términos generales, a dos causas:

Primero. Se cree que la tubería instalada en un agujero recto está más expuesta a destrucción, por vibración, a causa de que está ausente el efecto de amortiguación que se presenta cuando el agujero está ladeado. A menos que la tubería completa esté cementada, se producirán severas vibraciones durante la rotación de la tubería de perforación dentro de la tubería exterior.

Segundo. Cuando una larga tubería está suspendida en un pozo profundo, el factor de seguridad, para la junta superior bajo tensión, es, a menudo, menos de dos. Bajo tensión, la tubería se alarga, y esta prolongación es aumentada por elevadas temperaturas de tierra y por el calor de la reacción entre el agua y el cemento.

Después de endurecido el cemento, la junta superior de la tubería o revestimiento continúa llevando su original carga de tensión. Si por cualquier razón ocurriera un cambio de temperatura dentro o fuera de la tubería, la resultante contracción de la tubería podrá resultar destructiva, provocando así un trabajo de reparación difícil y costoso.

La reducción de temperatura dentro de la tubería sucede, de ordinario, después de que el cemento se ha endurecido. Podrá inyectarse en el pozo un lodo frío. En un caso, este factor solo fué suficiente para partir la tubería antes de ponerse en movimiento el vástago de perforación. Otras fallas han ocurrido después de que los pozos han empezado a producir, y se soponen que se han debido a las bajas temperaturas resultantes de la rápida dilatación de los gases de la formación.

Las vibraciones causadas por la rotación de la tubería de perforación serían naturalmente muy destructivas, en caso de que la tubería de revestimiento se encontrara sometida a la severa tensión resultante de las condiciones ya anotadas. Posiblemente, las vibraciones en este caso, son menos destructivas que el común sacudimiento de la tubería de perforación.

Las fallas de la tubería de revestimiento, del tipo descrito aquí, se están evitando por tres métodos de ataque:

1. Moderación de la tensión sobre las juntas superiores de la tubería.
2. Empleo de roscas o filetes curvos en la tubería.
3. Cementación de la mayor extensión de la tubería.

Al seguirse el primer método, bueno es ver que no se modere demasiado la tensión sobre las juntas superiores, para así evitar que la parte sin cementar de la tubería quede expuesta a tensión. En la página E-2 del Directorio de Equipo de Perforación (The Drilling Equipment Directory) se dan todos los datos necesarios para determinar la distancia correcta a que la junta superior ha de bajarse después de que el cemento se haya endurecido.

El segundo método ha tenido éxito, porque una rosca curva ofrece menos oportunidad a la concentración de fuerzas que la rosca en ángulo V. Las roscas curvas resultan especialmente satisfactorias en aquellos casos en que es necesario enfrentar las fuerzas vibracionales.

Se reduce el peligro de falla de tubería de pozo cuando se pone más cemento detrás de la tubería, y de seguro que desaparecerá del todo si la tubería se cementa en toda su extensión.

INFORME DIARIO ELECTRICO

La primera aplicación comercial del informe diario eléctrico consistió sencillamente en una curva de resistencia específica intermitente, obtenida de acusaciones anotadas cada 5 piés. Un refinamiento primitivo fué la anotación contínua de la misma curva de resistividad. Este paso fué seguido por la introducción del diagrama de potencial o porosidad, con anotación contínua de la primera y de la segunda curva.

La experiencia reveló ciertas limitaciones de las primeras dos curvas, potencial y resistividad, especialmente en la determinación del contenido líquido de las formaciones. Durante la perforación de un pozo, el agua del lodo invade, hasta cierto punto, las formaciones porosas. Si

(Continue en Pagina 225)

THE WORLD'S *MOST COMPLETE* GEOPHYSICAL RESEARCH LABORATORY

☆ In every country in the world where the search for oil goes forward, successful geophysical exploration depends upon *research.*

WESTERN GEOPHYSICAL COMPANY has the most complete research laboratory of its kind in the world, employing 42 technicians, using the most modern equipment available.

WESTERN draws from the cumulative experience of a large number of field crews operating in diverse localities and engaged in the solution of all types of geological problems. Twenty complete seismograph crews are in operation at the present time.

WESTERN designs and manufactures in its own shops all the geophysical instruments and equipment required for the operation of its field crews.

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WESTERN GEOPHYSICAL COMPANY, through years of experience and research in field and laboratory, is fully equipped to meet the needs of operators who demand the finest available Reflection Seismograph Surveys. Fully trained and experienced seismograph crews are available for work in any part of the world. Correspondence is invited.

★ Ya en la costa de la Argentina, ya entre las elevadas montañas del Perú, ya a las orillas de los ríos en el Brasil, ya debajo del lago Maracaibo, ya en las selvas de Venezuela . . . . no importa en qué lugar del mundo, el trabajo geofísico *verdaderamente satisfactorio* depende siempre de prolijo *estudio e investigación.*

LA WESTERN GEOPHYSICAL COMPANY tiene a su disposición el laboratorio de investigación más completo de su clase de todo el mundo. Da empleo a 42 técnicos y se vale del equipo más moderno que existe.

LA WESTERN basa sus conocimientos sobre la experiencia práctica de numerosas cuadrillas que trabajan en diversos lugares del mundo, dedicadas a resolver toda clase de problema geológico. Actualmente están trabajando veinte cuadrillas completas en estudios sismográficos.

LA WESTERN proyecta y fabrica, en sus propios talleres, todos los instrumentos geofísicos y todo el equipo que necesitan sus cuadrillas para hacer el trabajo.

LA WESTERN proyecta y fabrica también, en sus propios talleres, todo tipo de equipo de perforación para estudios o trabajos sismográficos, desde la pequeña perforada portátil, que puede llevarse en la mano, hasta el equipo grande, capaz de perforar agujeros hasta de 1800 piés de profundidad.

LA WESTERN GEOPHYSICAL COMPANY, gracias a años de experiencia, estudios e investigaciones prácticas y de laboratorio, está completamente preparada para satisfacer las necesidades de aquellas empresas que exigen los más exactos estudios geofísicos con sismógrafos de reflexión. Tenemos listos para trabajar en cualquiera parte del mundo, cuadrillas de gran competencia y experiencia profesional. Invitamos su correspondencia.

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PATTERSON-BALLAGH

1

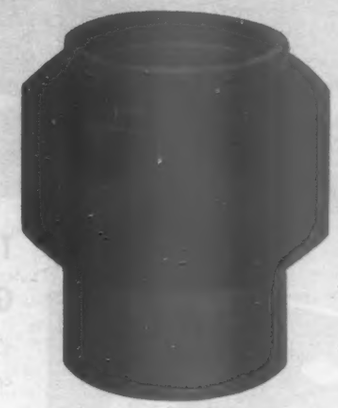
PROTECTORS

For protecting drill pipe and casing there is no substitute for Patterson-Ballagh Protectors, produced from the world's toughest and most durable rubber, processed by highly technical methods. Most economical, considering their long life and protection given to the well and equipment.

2

STABILIZERS

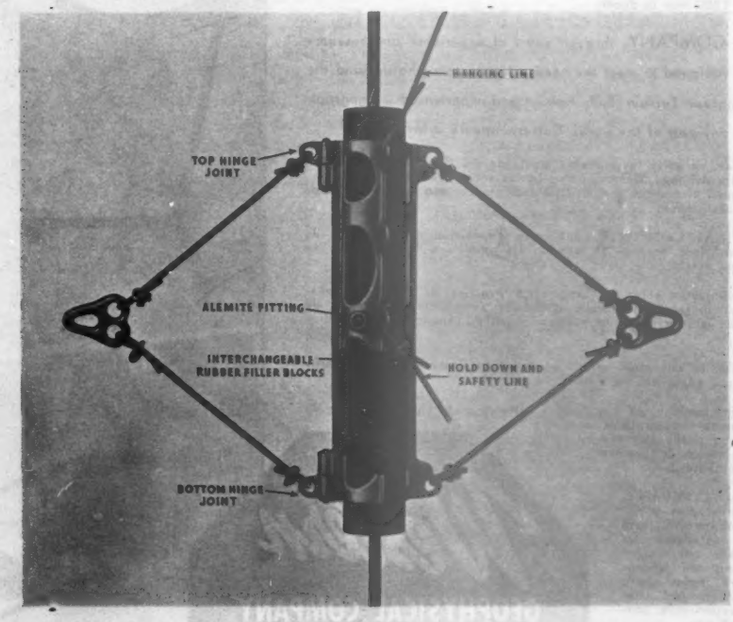
Patterson-Ballagh Stabilizers are extra large diameter and do not interfere with mud circulation. If used on stove-pipe casing these Stabilizers will practically eliminate trouble from collapsing or from a broken seat.



3

TUBING PROTECTORS

A molded, reinforced plastic protector fabricated onto the tubing collar. Oil and gas-proof. Saves collar and casing wear caused by pulsation of the tubing in pumping wells.



4

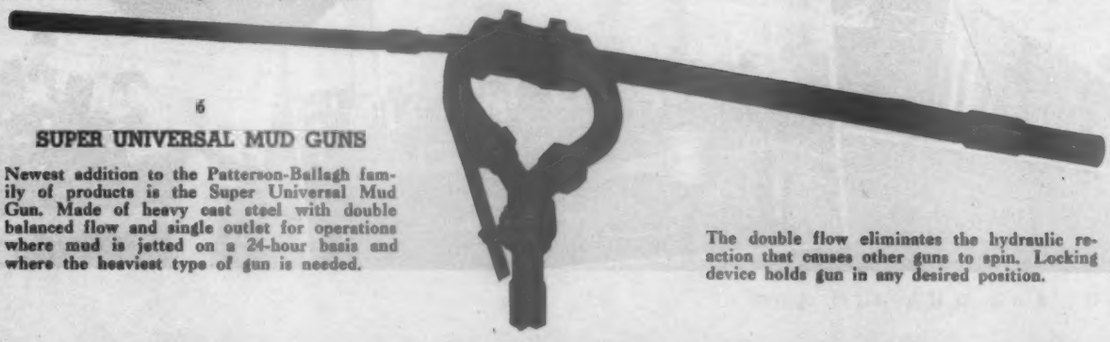
WIRE LINE GUIDES

Embodying a freely swinging, heavy, rubber-lined cylinder, the Patterson-Ballagh Wire Line Guide effectively dampens the whip and irons out the "traveling wave" which is prevalent when drilling at fast speeds or when tall derricks are used. Made in single, four, and six section units. A very serious fire hazard is removed, and, as there are no falling particles of metal or grease, no loss of time occurs. Drilling and wire line speeds can be increased, the life sometimes extending from 10% to 50%.

5

SWIVEL BAIL BUMPERS

For complete protection of the elevator bails and swivel a swivel bail bumper is necessary. This product eliminates metal-to-metal contact of elevator links with the swivel, thus reducing wear, decreasing fatigue, and making for safer operations. Available in sizes to fit all swivels.



6

SUPER UNIVERSAL MUD GUNS

Newest addition to the Patterson-Ballagh family of products is the Super Universal Mud Gun. Made of heavy cast steel with double balanced flow and single outlet for operations where mud is jetted on a 24-hour basis and where the heaviest type of gun is needed.

The double flow eliminates the hydraulic reaction that causes other guns to spin. Locking device holds gun in any desired position.

ful analysis of formation content in wells where invasion has occurred. The third curve is similar to the second curve, except that its depth of investigation is about 6 ft. Its use has eliminated the effects of invasion in a large number of wells, but it is not used without the second curve because it is ineffective on formations less than 5 ft. thick.

When it is believed that the third curve does not have sufficient depth of investigation for the well involved, or when thin resistive streaks are present, a fourth curve is recorded. The fourth curve has a depth of investigation of about 10 ft. and is obtained with a different electrode arrangement. It will eliminate the effect of invasion in all formations with the possible exception of depleted sands, which are often deeply invaded. It will also detect resistive beds not more than a few feet thick. Since the fourth curve is subject to electrical limitations and requires special care in analyzing and interpreting, it is used only when the necessity arises.

Electric logs are used in solving an increasingly large number of problems. The logs, being kept as permanent records of the wells, are often used for problems that were not contemplated when they were made. Reasons for making electric logs may be divided into two groups. The first group depends upon the ability of electric logging to determine the lithologic character and thickness of the formations penetrated. Matters of geologic correlation fall in this group. The second group depends on ability to determine fluid content of the porous formation. Well completion, reconditioning, and many other production problems lie in the second group.

CORE ORIENTATION

Cores taken from the drill hole have long been depended upon for information relative to reservoir conditions, selection of casing points, correlations, and geologic exploration. It now appears that the commercial application of core orientation will greatly extend the value of coring. Core orientation makes it possible to determine the direction of dip of subsurface strata at each location. Without core orientation the magnitude of the subsurface dip could often be determined by coring, but the direction of dip could be found only by comparing elevation of formation tops in two or more wells.

In 1927 H. N. Herrick and E. D. Lynton, of Standard Oil Co. of California, were working with a magnetometer party. In the vicinity of

(Continued on Page 230

Well-head assembly designed for gas injection during the early life of an Illinois field. High-pressure fittings must be used because of the high-formation pressures

Grupo de cabeza de pozo proyectado para la inyección de gas durante la iniciación de un campo petrolífero en Illinois. Es necesario emplear conexiones de alta presión, debido a las grandes presiones de la formación

la profundidad de la investigación del instrumento de exploración es menor que la profundidad invadida, las acusaciones de resistividad obtenidas no se relacionan con la verdadera resistividad de las formaciones, sino que son, en efecto, acusaciones que corresponden a las arenas invadidas por el agua.

Aumentando la distancia entre los electrodos, la profundidad de la investigación se agranda durante el procedimiento de informe eléctrico. De este modo, los efectos de la invasión del agua se eliminan. Se han emprendido estudios experimentales para determinar las profundidades de investigación necesarias para sobreponerse a las influencias de la invasión. Como resultado de ésto, la práctica corriente es ahora registrar simultaneamente tres curvas. La primera es la curva de potencial o porosidad. La segunda es la curva de resistividad normal, que tiene una profundidad de investigación de como 3 piés. Su función es definir las formaciones e indicar los niveles superiores e inferiores de todas las capas de resistencia, cuyo espesor no pase de 1½ pié. Su limitación es que produce un análisis dudoso del contenido de la formación en pozos en que ha ocurrido invasión. La tercera curva es similar a la segunda, exceptuando que la profunidad de investigación es cerca de 6 piés. Su uso ha suprimido los efectos de la invasión en un gran número de pozos, pero no se utiliza sin la segunda curva, a causa de que es inefectiva en formaciones de menos de 5 piés de espesor.

Cuando se cree que la tercera curva no tiene suficiente profundidad de investigación para el pozo del caso, o cuando se presentan delgadas capas de resistencia, se registra entonces una cuarta curva. La cuarta curva tiene una profunidad de investigación de cerca de 10 piés, y se obtiene mediante un diferente arreglo de electrodos. Sirve para suprimir el efecto de la invasión en todas las formaciones, con la posible excepción de las arenas agotadas, las cuales, a menudo, se presentan profundamente invadidas. También sirve para descubrir capas resistentes de pocos piés de espesor. Como la cuarta curva está sujeta a limitaciones elétricas y requiere un cuidado especial para su análisis e interpretación, se utiliza sólo en caso de urgente necesidad.

Los informes diarios eléctricos se usan en la solución de un creciente número de problemas. Los informes, conservados como datos permanentes de los pozos, se aprovechan, a menudo, para resolver problemas, que no se anticipaban en la época en que se hicieron. Las razones para hacer informes eléctricos pueden clasificarse en dos grupos. El primer grupo depende de la facultad del informe eléctrico para determinar el character litológico y el espesor de las formaciones penetradas. En este grupo se comprenden los estudios de correlación geológica. El segundo grupo depende de la facultad del método elétrico para determinar el contenido líquido de la formación porosa. La terminación, rehabilitación y otros problemas de producción, de los pozos, se incluyen también en este segundo grupo.

ORIENTACION DE NUCLEOS

Los núcleos o muestras sacadas del agujero perforado han servido, desde hace tiempo, de base para información relativa a las condiciones del yacimiento, selección de puntos de revestimiento o tubería, correlaciones y exploración geológica. Se ve ahora que la aplicación comercial de la orientación de núcleos extenderá grandemente el valor práctico de sacar muestras o núcleos. La orientación de núcleos hace posible determinar la dirección de la inclinación de las estratas subterráneas de cada formación. Sin la orientación de núcleos, la magnitud de la inclinación de las estratas subterráneas podía determinarse sacando núcleos o muestras, pero la dirección de la inclinación podía sólo descubrirse comparando la elevación de los niveles superiores de la formación en dos o más pozos.

En 1937, H. N. Herrick y E. D. Lynton, de la Standard Oil Co. of California, estaban trabajando con un cuerpo de ingenieros encargados de hacer ensayos con magnetómetro. En la vecindad de un afloramiento de "gabbro" observaron que el equilibrio de intensidad vertical daba altas acusaciones. Rompieron un pedazo de gabbro, que es una roca que contiene minerales magnéticos, y lo colocaron contra el extrèmo norte del sistema magnético. La aguja reaccionó en una dirección, pero cuando el otro lado del pedazo fué expuesto a la aguja, ésta se devisó en sentido opuesto. Esto indujo a los investigadores a considerar la posibilidad de construir un instrumento con bastante sensitividad para medir la polaridad residual de los granos minerales en rocas sedimentarias.

La orientación polar de núcleos se basa sobre el hecho de que ciertos minerales adquieren y retienen una cierta cantidad de polaridad del campo magnético terrestre. Los minerales que exhiben esta propiedad, que llamamos aquí, polaridad, han sido clasificados por T. Crook, como sigue:

Altamente magnéticos: magnetita y pirrotita.

Moderadamente magnéticos: ilmenita, cromita, almandina y glauconita.

Debilmente magnéticos: mozanita, staurolita y tourmalina.

Casi no magnéticos: cuarzo, feldespatos, zircón, quianita y espinel.

Los núcleos o muestras de formaciónes calizas puras, de dolomita, anhidrita o de diatomita, no muestran

Continue en Pagina 230)

It's good judgement

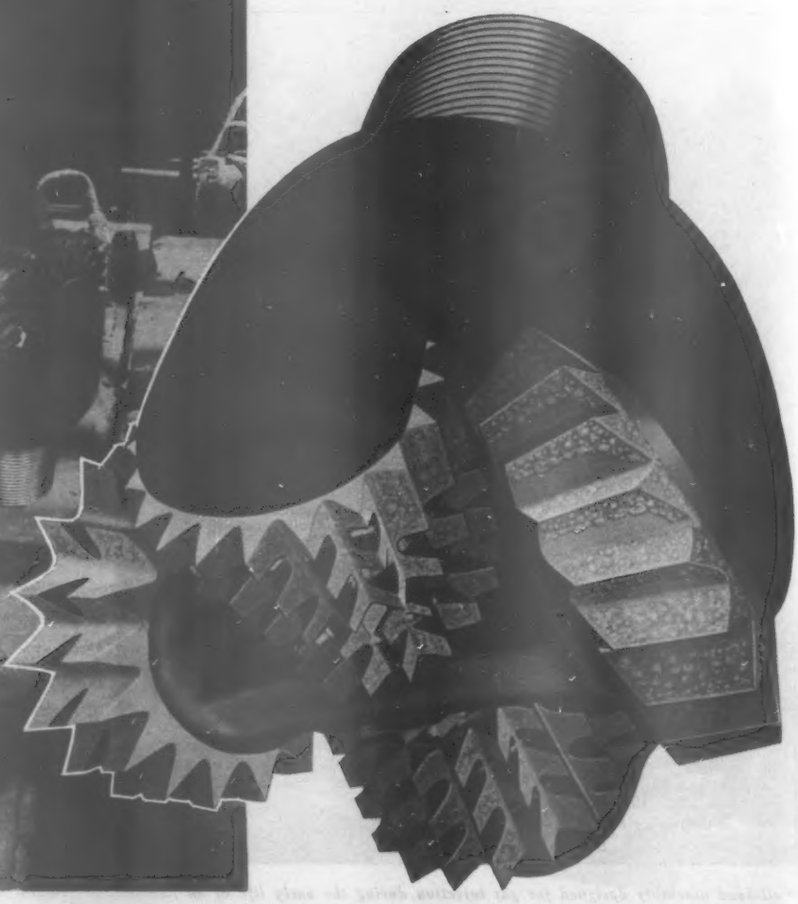
"PUT ON ANOTHER REED, JACK, THOSE BITS SURE GET THE FOOTAGE"

RE ROCK

SPEED WITH LESS WEIGHT

•

MORE HOLE PER BIT



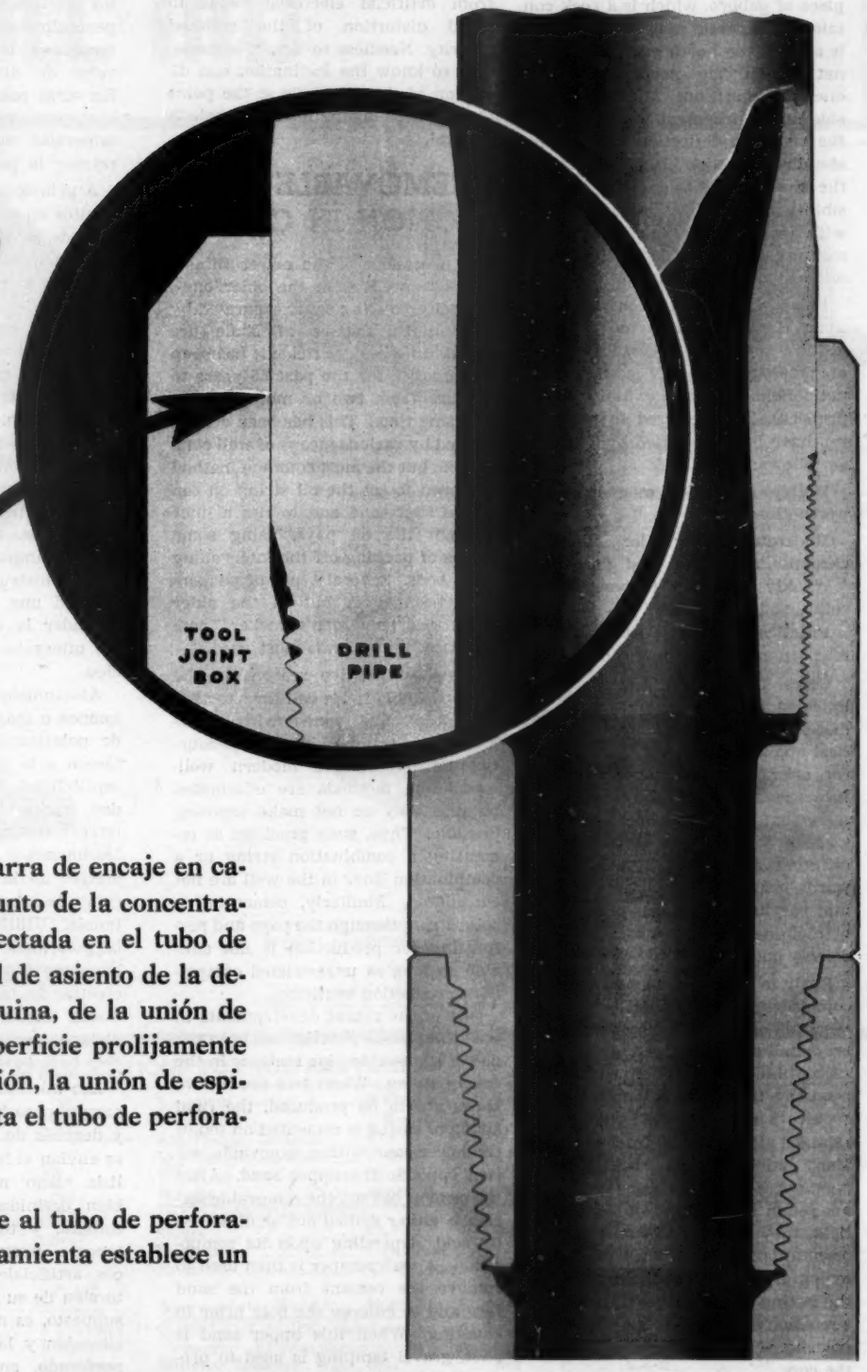
P. O. BOX 2119

REED ROLLER

stronger drilling string

use

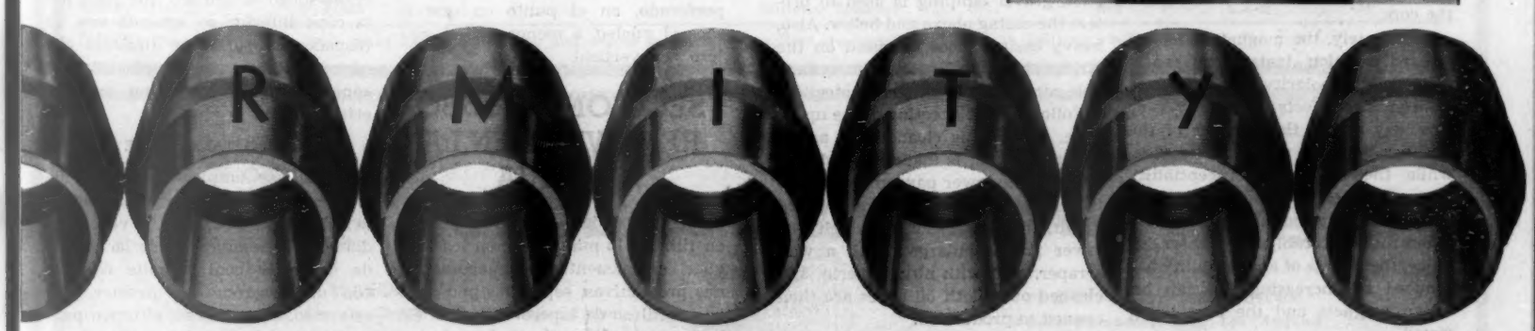
REED
SHRINK GRIP
TOOL JOINTS
COUNTERBORE GRIP



The
"SAFETY AREA"
SHRUNK ONTO THE DRILL PIPE
FOR GREATER SAFETY

La unión de espiga y caja Reed de garra de encaje en caliente, para herramientas, pasa por el punto de la concentración de tensión, en la última rosca conectada en el tubo de perforación. Gracias a la larga longitud de asiento de la depresión cuidadosamente labrada a máquina, de la unión de espiga y caja, que corresponde a la superficie prolijamente labrada a máquina del tubo de perforación, la unión de espiga y caja de herramienta agarra y soporta el tubo de perforación más allá de su sección roscada.

Además de proveer adicional soporte al tubo de perforación, esta unión de espiga y caja de herramienta establece un cierre seguro para evitar escapes.



IDAD—PROLONGADA DURACION Y EXCELENTE FUNCIONAMIENTO A LAS UNIONES DE ESPIGA Y CAJA REED PARA HERRAMIENTAS

BIT COMPANY HOUSTON TEXAS

a gabbro outcrop they noticed that the vertical intensity balance gave high readings. They broke off a piece of gabbro, which is a rock containing magnetic minerals, and held it against the north end of the magnet system. The needle reacted in one direction; but when the other side of the fragment was offered to the needle, a deflection in the opposite direction took place. This caused the investigators to consider the possibility of building an instrument with sensitivity high enough to measure the residual polarity of the mineral grains in sedimentary rocks.

Polar core orientation is based upon the fact that some minerals acquire and retain a certain amount of polarity from the earth's magnetic field. Minerals exhibiting this property, here referred to as polarity, have been classified by T. Crook as follows:

Highly magnetic: magnetite and pyrrhotite.

Moderately magnetic: ilmenite, chromite, almandine, and glauconite.

Weakly magnetic: monazite, staurolite, and tourmaline.

Practically nonmagnetic: quartz, felspars, zircon, kyanite, and spinel.

Cores from pure formations of limestone, dolomite, anhydrite, or diatomite show no polarity in practical application, and are of no value for orientation purposes. However, formation cores usually consist of a somewhat heterogeneous mass of various kinds of minerals having different characteristics. In other words, virtually all cores will contain varying percentages of the magnetic minerals that will retain the earth's polarity.

Early in the experimental work of core orientation it became known that minerals often exhibit another property similar to polarity. This is called susceptibility and is defined as that property that enables a mineral to acquire a magnetic field that is not retained after removal from the field. Many minerals are susceptible to magnetic forces, but, since they do not retain the polarity of the earth's field, they are of no benefit in core orientation. Instead, they pick up a temporary field from the magnets of the testing instrument and thus cause a reaction that tends to mask the true polarity of the polarized minerals in the core.

Fortunately, the magnet system of the polarization instrument reacts differently to polarity than to susceptibility. The effects of polarity vary inversely as the third power of the distance between magnets and core, while the effects of susceptibility vary as the sixth power of this distance. Utilizing the fact that polarity reacts more favorably at a greater distance, the effects of susceptibility are reduced by increasing the gap between magnets and the core being tested.

Cores are now selected in the field for orientation purposes and, after careful marking, they are sent to the laboratory for analysis. Only cores with good bedding planes are desirable, and these must be kept away from artificial electrical fields to avoid distortion of the residual polarity. Needless to say, it is necessary to know the inclination and direction of the drill hole at the point the core was taken, unless the hole is vertical.

REMOVABLE PIPE SECTION IN CASING

In a number of the newer Illinois fields, as well as in the older ones, several producing zones separated by varying thicknesses of shale are found. In the older fields it has been the practice for the past 25 years to produce from two or more pays at the same time. This has been accomplished by various means of well completion, but the most common method has been to set the oil string on top of the first sand and to run a liner through the oil pays, using some means of packing off the intervening shale beds. Several types of packers have been used, but in the older fields the "poor man's packer," consisting of burlap, was most used.

Since competitive reasons in the newer Illinois fields call for shooting the productive zones with nitroglycerin in order to increase production, many of the modern well-completion methods are eliminated because they do not make shooting possible. Thus, such practices as cementing a combination string or a combination liner in the well are not considered. Similarly, cementing a solid string through the pays and perforating for production is not suitable so long as unrestricted competitive production continues.

One of the recent developments in well-completion practice has been the use of removable pipe sections in the casing string. When two productive zones are to be produced, the final string of casing is cemented on top of the lower sand with a removable section opposite the upper sand. After the cement has set, the removable section is either drilled out or dissolved by acid, depending upon its composition. A wall scraper is then used to remove the cement from the sand face and to enlarge the hole prior to shooting. When this upper sand is shot, gravel tamping is used to protect the casing above and below. Also, heavy casing shoes are used on the string above and below the removable section for additional protection.

Following the shooting of the upper zone, the hole is cleaned out and a production test is made. In order to open up the lower pay sand, the hole is reentered, drilled to the desired depth; then the hole through the lower pay is enlarged with a wall scraper, shot with nitroglycerin, and cleaned out. Both oil zones are then opened to production.

DRILLABLE PIPE

When drillable pipe is used for the

(Continued on Page 236)

ninguna polaridad, en aplicación práctica, y no tienen valor para los dines de orientación. Sin embargo, los núcleos de formación consisten generalmente en una masa algo heterogénea de varias clases de minerales de diferentes características. En otras palabras, todos los núcleos contienen variables porcentajes de minerales magnéticos, que pueden retener la polaridad terrestre.

A principios del trabajo de experimentos en materia de orientación de núcleos, se descubrió que los minerales a menudo exhiben otra propiedad similar a la polaridad. Esto se llama susceptibilidad y se define diciendo que es la propiedad que habilita a un mineral para adquirir un campo magnético, que no es retenido después de retirado el metal del punto de su orígen. Muchos minerales son susceptibles a las fuerzas magnéticas, pero como no retienen la polaridad del campo terrestre, no son de ningún beneficio en la orientación de núcleos. Lo que hacen es recoger un campo temporario de los imanes del instrumento de ensayo y causan así una reacción que tiende a esconder la verdadera polaridad de los minerales polarizados en el núcleo.

Afortunadamente, el sistema de imanes o magnético del instrumento de polarización reacciona diferentemente a la polaridad que a la susceptibilidad. Los efectos de la polaridad varían inversamente, como la tercera fuerza de la distancia entre los imanes y el núcleo, mientras los efectos de la susceptibilidad varían como la sexta fuerza de esta distancia. Utilizando el hecho de que la polaridad reacciona más favorablemente a una mayor distancia, los efectos de la susceptibilidad se reducen mediante un aumento de la distancia entre los imanes y el núcleo bajo ensayo.

Los núcleos se eligen ahora en el campo, para los fines de orientación, y después de marcados con cuidado, se envian al laboratorio, para su análisis. Sólo núcleos con divisiones bien definidas se aceptan para el estudio, y todos ellos deben mantenerse apartados de campos eléctricos artificiales, para evitar la distorsión de su polaridad residual. Por supuesto, es necesario conocer la inclinación y la dirección del agujero perforado, en el punto en que se saca el núcleo, a menos que el agujero sea vertical.

SECCION DE TUBO REMOVIBLE EN LA TUBERIA

En varios de las nuevos campos en Illinois, lo mismo que en los antiguos, se encuentran numerosas zonas productivas, separadas por esquisto arcilloso de espesor variable. En los campos más antiguos, la práctica, estos últimos 25 años, ha sido producir de dos o más estratas petrolíferas al mismo tiempo. Esto se ha realizado mediante varios métodos de terminación de pozo, pero el más común de todos ha sido colocar la tubería de petróleo encima de la primera capa de arena y pasar otra tubería por las capas productivas, usando algún medio de obturación en las capas intermedias de esquisto arcilloso. Varios tipos de obturadores se han empleado para este fin, pero en los campos más antiguos, el que más se ha usado es uno llamado "el obturador del hombre pobre," hecho de arpillera.

En vista de que las condiciones de competencia, en los nuevos campos en Illinois, exigen la dinamitación de las zonas productivas, con nitroglicerina, se han abandonado muchos de los modernos métodos de terminación de pozo, a causa de que éstos no admiten el procedimiento de dinamitación. Por esta razón, prácticas como la de cementar una tubería de combinación, no se toman en consideración. Al mismo tiempo, la cementación de una tubería sólida, a traves de las capas productivas, y su perforación para los fines de la producción, no resulta conveniente mientras continúe activa la producción competidora sin restricción.

Uno de los recientes desarrollos en la práctica de la terminación de pozos ha sido el uso de secciones de tubo removibles en la tubería. Cuando dos zonas se someten a producción, la tubería final se cementa encima de la capa inferior de arena, con una sección removible al frente de la capa superior de arena. Después de endurecido el cemento, la sección removible es cortada o disuelta por ácido, según sea su composición. Se usa después un raspador de pared, para quitar el cemento de la superficie de la arena y agrandar el agujero con antelación a la dinamitación. Cuando esta capa superior de arena es dinamitada, se apisona grava o cascajo para proteger la tubería por arriba y por abajo. También se emplean pesadas zapatas de tubo, en la tubería arriba y debajo de la sección removible, para protección adicional.

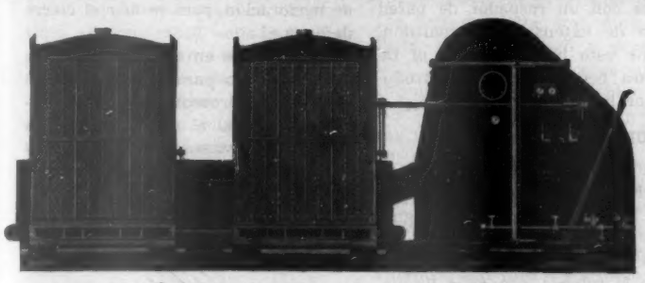
A continuación de la dinamitación de la zona superior, el agujero se limpia y se hace un ensayo de producción. Para abrir la capa petrolífera inferior, se perfora más el agujero, hasta la profundidad conveniente; luego el agujero que pasa por la capa inferior se agranda con un raspador de pared, se dinamita con nitroglicerina y se limpia. Ambas zonas petrolíferas quedan así abiertas para su producción.

TUBO TALADRABLE

Cuando se emplea un tubo taladrable para la sección removible de la tubería, aquel tiene, a veces, un diámetro menor que el de la tubería de acero, lo cual permite cortarlo con una barrena de arrastre. En este caso, sin embargo, el tapón para cementar debe quedar arriba de la sección reducida, y esto, a menudo exige dejar un considerable largo

(Continue en Pagina 236)

THERE'S A PORTABLE RIG FOR EVERY DRILLING DEPTH

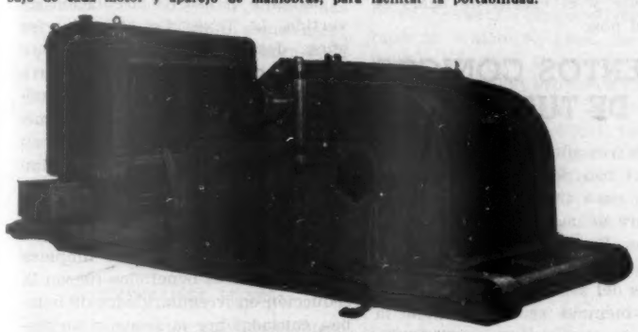


MODEL 1061 FOR 10,000-FT. DRILLING

Side view showing: Air control valves for clutches; oil pressure gauge; vacuum gauges for synchronizing engines; engine throttle, and brake lever. Skids under each engine and draw works for portability.

MODELO 1061 PARA PERFORACION DE 10.000 PIES

Vista lateral, en la cual se ven: válvulas de gobierno de aire para los embragues; manómetro de presión de aceite; manómetros de vacío para la sincronización de los motores; estrangulador o gobierno de los motores y palanca de enfranmiento. Patines debajo de cada motor y aparejo de maniobras, para facilitar la portabilidad.

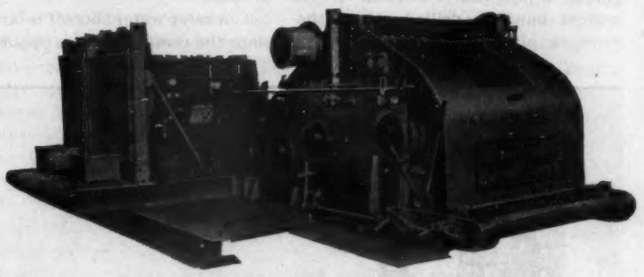


MODEL 35 FOR 3,000-FT. DRILLING

Showing: Rig with single engine drive (can be furnished with dual engine drive.) Can be mounted on substructure of any desired height, or mounted on truck for well servicing and drilling where moves are frequent.

MODELO 35 PARA PERFORACION DE 3.000 PIES

Mostramos: aparejo de perforación accionado por un solo motor (puede suministrarse también con dos motores). Puede montarse sobre substructura de cualquiera altura deseada, o instalarse en camión, para servicio y perforación de pozo, donde son frecuentes las mudanzas.

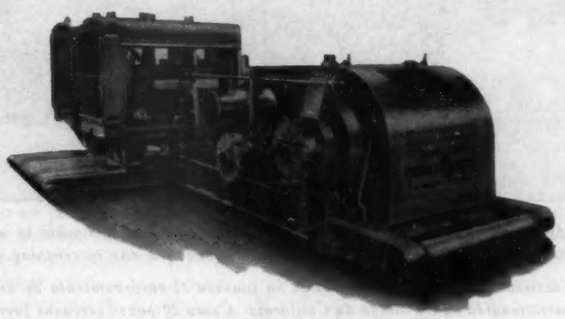


MODEL R-876-8A FOR 7,500-FT. DRILLING

Showing: Centralized controls at driller's position; rig transported in three sections—draw works, engines, and substructures.

MODELO R-876-8A PARA PERFORACION DE 7.500 PIES

Mostramos aquí: Gobiernos centralizados al fácil alcance del operario; instalación transportada en tres secciones—aparejo de maniobras, motores y subestructuras.



MODEL CT-5 FOR 6,000-FT. DRILLING

Showing: Simplified controls at driller's position; and hydraulic mechanism for actuation of clutches.

MODELO CT-5 PARA PERFORACION DE 6.000 PIES

Mostramos: Gobiernos simplificados al fácil alcance del operario, y mecanismo hidráulico para la actuación de los embragues.

GENERAL SPECIFICATIONS FOR THE ABOVE RIGS

	1061	R-876-8A	CT-5	35
Depth Recommended	10,000'	7,500'	6.000'	3,000'
DRAW WORKS				
Drum Shaft	9¼"	7⅞"	6¼"	4¾"
Line Shaft	7"	5"	4½"	3½"
Rotary Shaft	4½"	4½"	4¾"	3½"
Brakes—Type	Water Cooled	Water Cooled	Water Cooled (Optional)	Conventional
Brake Width	10½"	10"	9¾"	8"
Brake Drum Diameter	54"	40"	40"	36"
Drum Spool Dimension	24"x44"	18"x30"	18"x30"	16"x26"
Drum Clutches	Friction	Friction	Friction	Friction
Speed on Drum	8 Forward 4 Reverse	8 Forward 6 Reverse	5 Forward 3 Reverse	3 Forward 1 Reverse
Rotary Clutch	Friction	Friction	Friction	Friction
Speed on Rotary	8 Forward 4 Reverse	8 Forward 6 Reverse	4 Forward 3 Reverse	3 Forward 1 Reverse
Rig Height—overall	6' 4"	6' 9"	5' 0"	4' 7½"
Rig Length—overall	8' 0"	14' 6"	13' 0"	10' 0"
Width on Derrick Floor	20' 0"	6' 11"	6' 7½"	5' 1½"
Weight	48,000 lbs.	25.000 lbs.	18,000 lbs.	10,000 lbs.
DUAL ENGINE DRIVE:				
Shafts	5 1/16"	5 1/16"	5 1/16"	4"
Lubrication	2 Oil Pumps	2 Oil Pumps	2 Oil Pumps	2 Oil Pumps
Skids	12" H. Beam	8" 40 lb. H. Beam	8" 40 lb. H. Beam	8" 40 lb. H. Beam
Approximate Weight	10.000 lbs.	8.000 lbs.	7.000 lbs.	4.200 lbs.
SUBSTRUCTURE: Substructure may be furnished on any rig at height desired by operator. Engines specification submitted on request.				
Bulletin Number	1061	876	CT-5	35

NOTE: Pump Drives vary with make and size of pump and engine speed. All capacities are based on 4½-16.6 lb. drill pipe with tool joints.

MAIN OFFICE AND PLANT
1422 MAURY STREET
HOUSTON, TEXAS

PORTABLE RIG COMPANY

EXPORT OFFICE
30 ROCKEFELLER PLAZA
NEW YORK
CODE—"PORTRIG"

BRANCHES:
Dallas, Longview, Corpus Christi, Wichita Falls, Tulsa

PACIFIC COAST DISTRIBUTORS:
Wagner-Morehouse, Inc., Los Angeles

removable section of the casing, it is composed of aluminum alloy. This pipe is sometimes smaller in diameter than the steel casing, thus making it possible to drill it out with a common drag bit. In this case, however, the cementing plug must be stopped above the reduced section, and this often calls for leaving a considerable length of pipe full of cement. When cement must be drilled out of the drillable pipe, care is necessary to prevent forcing the bit away from the original hole and thus sidetracking the lower portion of steel pipe.

Usually, drillable pipe of the same diameter as the casing is used for the removable section, and this is removed with an expanding wall scaper. With this procedure the cementing plug can be pumped down past the drillable section.

ACID-SOLUBLE PIPE

When the removable section is made up of acid-soluble metal (magnesium alloy), the procedure after the cementing job is to displace the mud from the casing with clear water. Then 1,000 to 1,500 gal. of 15 per cent hydrochloric acid is introduced. When hydrogen gas ceases to issue from the well, the dissolving action is complete, and the excess acid is flushed from the well.

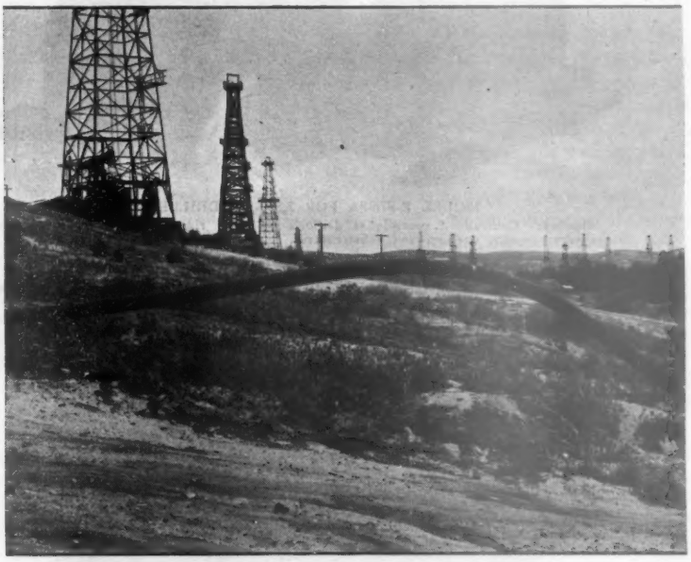
TAPERED CASING SEATS

Two or three years ago Pure Oil Co. pioneered the use of a tapered casing seat, the purpose of which was to form a water shutoff without the use of cement. Since its introduction, certain other advantages of the tapered seat have become apparent, so that it is often used when casing is to be cemented. In this case its advantageous features are listed as:

1. It is one means of centering the casing shoe so that cement can be distributed equally on all sides, thus preventing corrosion by ground waters.

2. Shoulders that might otherwise be left for tools to hang up on at the point where the hole is reduced are avoided.

3. A safer water shutoff is obtained, since the cement has less opportunity to fail when it is confined by the tight-fitting casing shoe.



Slippage along an active fault has caused this pipe line to buckle in a California field. About 20 nearby wells have been abandoned due to crushing of casing

El deslizamiento en una falla activa ha causado el encorvamiento de esta linea de tubería tendida en un campo de California. Como 20 pozos cercanos fueron abandonados, debido al aplastamiento de la tubería de revestimiento

In the majority of cases, the tapered casing seat has been used in Illinois for uncemented strings. In this case the procedure is as follows:

A 3-ft. taper is made in reducing the hole from 8¾ to 6¼ in. This is done with a special tapered drag-type reamer having a 6¼-in. rock bit at its base. As soon as the casing point is reached, this tool is run on the drill pipe. The top of the reamer, being 8¾ in. in diameter, serves to center the tool so that the rock bit will leave the same width of shoulder on all sides. Four feet of hole are drilled with this tool, making 1 ft. of 6¼-in. hole and 3 ft. of tapered hole. Usually, the productive formation is drilled before the casing is run; but this does not affect casing procedure, as the string is simply lowered until the shoe rests in the taper where the shutoff is formed. Sometimes a swabbing test or a drill-stem test is made to test the water shutoff.

In cases where a tapered seat is used for a cemented string of casing, the drilling procedure is the same as described above. The casing is raised a few feet above the taper while the cement is placed; then the shoe is lowered into the taper, centering itself in the process.

(Continued on Page 241)

de tubo lleno de cemento. Al quitar el cemento, por perforación, del tubo taladrable, es necesario cuidar de no apartar la barrena del agujero original, para no echar a un lado la parte inferior del tubo de acero.

Por lo general, el tubo taladrable de la sección removible tiene un diámetro igual al de la tubería, y se quita con un raspador de pared de tipo de extensión o expansión. Mediante este procedimiento, el tapón para cementar puede introducirse por la sección taladrable.

TUBO SOLUBLE EN ACIDO

Cuando la sección removible se hace de metal solubre en ácido (como lo es la aleación de magnesio) el procedimiento, después del trabajo de cementar, es quitar el lodo de la tubería, con agua limpia. Luego se introducen de 1000 a 1500 galones de solución de 15% de ácido hidroclórico. Cuando cesa de salir del pozo gas de hidrógeno, quiere decir que está terminada la acción disolvente y el exceso de ácido se lava del pozo.

ASIENTOS CONICOS DE TUBERIA

Dos o tres año ha, la Pure Oil Co. inició el uso del asiento cónico de tubería, cuyo fin obedeció a formar un cierre de agua, sin la ayuda de cemento. Desde su introducción, se han hecho evidentes ciertas otras ventajas del asiento cónico, de modo que a menudo se usa cuando la tubería ha de cementarse. En este caso, sus ventajas principales son las siguientes:

1. Es un medio de centrar la zapata de tubería, de modo que el cemento quede igualmente distribuido entre todos los lados, evitándose así la corrosión por el agua terrenal.

2. Los rebordes, que de otro modo, pudieran quedar propensos a sujetar las herramientas, en el punto en que está reducido el agujero, quedan así suprimidos.

3. Se obtiene un cierre de agua más seguro, a causa de que el cemento tiene menos oportunidad de fallar cuando está confinado por zapata de tubería de ajuste apretado.

En la mayor parte de los casos, el asiento cónico de tubería se ha usado en Illinois para tubería sin cementación. En este caso, el procedimiento es el siguiente:

Se hace un cono de 3 pies, al reducir el agujero de 8¾ a 6¼". Esto se efectúa con un escariador cónico especial, de tipo de arrastre, con barrena para roca, de 6¼", al fondo. Tan pronto como se llega a la punta del la tubería, esta herramienta se corre por la tubería de perforación la parte superior del escariador, que tiene 8¾" de diámetro, sirve para centrar la herramienta, de modo que la barrena para roca deje igual anchura de reborde en todos los lados. Cuatro piés de agujero se perforan con esta herramienta, haciendo un pié de agujero de 6¼" y tres piés de agujero cónico. Generalmente, la formación productiva se perfora antes de bajar la tubería, pero esto no afecta al procedimiento, pues la tubería es bajada hasta que la zapata descanza en la sección cónica, donde está formado el cierre. A veces se efectúa un ensayo con limpia tubos o un ensayo con vástago de perforación, para probar el cierre de agua.

En los casos en que se emplea un asiento cónico para una tubería cementada, el procedimiento de perforación es igual al descrito aquí. La tubería se levanta unos pocos piés sobre el asiento cónico, mientras se está colocando el cemento; luego se baja la zapata sobre el asiento cónico, centrándose automaticamente en su descenso.

TUBERIAS CON EMPAQUE DE GRAVA O CASCAJO

Mediante el uso de circulación invertida, la Texas Co., hace varios años, desarrolló un procedimiento satisfactorio para empacar con grava sus pozos en California. El beneficio principal, que resulta de este método de terminación, se presentó en una reducción del tiempo de limpieza. Los pozos con empaque de grava, en el valle de San Joaquín, se vió que exigieron sólo como una cuerta parte del tiempo de limpieza ordinario. Otros beneficios fueron la reducción en irregularidades de bombas, causadas por la arena, y un mejoramiento aparente en las características de declinación de producción, en algunos casos.

Para la realización del procedimiento de empaque con grava, tal como ha sido perfeccionado por la Texas Co., la tubería se cementa primero encima de la zona petrolífera. Después de perforar hasta la profundidad más conveniente del caso, se procede al ensanchamiento, usando un raspador de pared en la tubería de perforación. La completa sección productiva es ensanchada, y está es, a veces, de un espesor de más de 250 piés. El diámetro del agujero agrandado ha sido, en algunos casos, hasta 30"; pero a menos que sea blanda la formación, semejante agujero es generalmente considerado demasiado costoso. Por lo general se emplean agujeros de 11 a 20" de diámetro, pues parece que de esta manera se realizan los fines principales a un costo más bajo. Las tuberías que se meten en estos agujeros tienen, ordinariamente, 6⅝" in diámetro exterior. La grava pasada por mallas de ¼ a ⅜" es la que resulta más conveniente.

TUBO CON FORRO DE CEMMENTO

Este tubo tiene una sección ranurada, que corresponde al espesor de la zona petrolífera. Arriba de esta sección, hay otra tapada, de como 100 piés de longitud, que entra en la tubería. El tubo baja por la tu-

(Continue en Pagina 241)

GRAVEL-PACKING LINERS

Through the use of reversed circulation, Texas Co. several years ago developed a satisfactory procedure for gravel-packing its wells in California. The chief benefit resulting from this method of completion was found to be reduction of cleanout time. Gravel-packed wells in the San Joaquin Valley were found to require only about one-fourth of the usual cleanout time. Other benefits were reduction of pump troubles caused by sand, and an apparent improvement in production-decline characteristics in some cases.

In carrying out the gravel-packing procedure as developed by Texas Co., casing is first cemented on top of the oil zone. After drilling to the selected total depth, underreaming is commenced, using a wall scraper on the drill pipe. The entire productive section is underreamed, this sometimes being more than 250 ft. in thickness. The diameter of the enlarged hole has been as much as 30 in. in some cases; but unless the formation is soft, such a hole is usually considered too costly. Holes 11 to 20 in. in diameter are generally used, because it appears that the chief purposes are in this way accomplished with a smaller expenditure. Liners set in these holes are usually 6⅝ in. o.d. Gravel of ¼ to ⅜-in. mesh appears to be mose suitable.

CEMENT-LINED LINERS

The liner is made up with a slotted section corresponding to the thickness of the oil zone. Above this is a blank section about 100 ft. long to extend up into the casing. The liner is run on the drill pipe, which supports it either at the top or at the bottom. When the liner is suspended from its top, a special type is used which is lined with a cement sleeve. This sleeve closes the perforations or slots so that the circulating fluid is forced to pass around the liner shoe. After the gravel has been placed, the cement sleeve is drilled out to open the perforations.

Usually the liner is supported at its bottom by means of a string of tubing that extends from the drill pipe down through the liner, screwing into a plate at the bottom with left-hand threads. In this case, the cement sleeve in the liner is not essential, but it is often used as added protection against clogging of perforations during installation. When long liners with cement sleeves are run it is usual to support them at the base, to avoid possibility of damage due to stretching. At the top of the liner, a hood on the drill pipe prevents gravel from getting in between the liner and tubing. Steel fins are used on the outside of the liner to center it in the casing.

During placement of the gravel, the liner is held a foot or two off bottom while mud is pumped down the outside of the drill stem, using a special surface hookup. Gravel is lubricated into the mud stream in batches of 5 to 10 cu. ft. The mud consists only of colloidal material and water. It must be of sufficient viscosity to carry the gravel, and yet it must be washed out easily when the gravel is in place. Stormer viscosity of 25 to 35 has been found satisfactory.

The gravel-carrying mud goes to the bottom of the well outside the liner, passes through a perforated bull plug, and proceeds upward through tubing and drill pipe to the surface. The gravel builds up outside the liner. Enough gravel is used to fill the calculated space, plus about 10 per cent, to fill irregularities and the space behind the blank liner.

When all gravel is in place, water circulation is substituted for mud circulation, and this is continued until the water returning to the surface is clean. By turning the drill pipe to the left the liner is then released. A bit is used on the drill pipe to remove the cement sleeve from the liner.

Recent gravel-packing operations favor the use of a comparatively small hole in which to pack the liner, usually less than 15 in. in diameter. This development has taken place because sand screening has been the result most desired, and it has been found that a 2-in. pack of well-selected gravel is sufficient for screening. A larger hole has a natural advantage; but on the other hand, a large hole often increases the investment in the well by as much as 50 per cent.

With smaller holes in use, the problem of centering the liner so that the thickness of gravel on all sides is equal becomes more imminent. Steel centering springs have been introduced that compress in order to pass through the casing, then expand against the walls of the enlarged hole.

One type of liner is run into the hole with the gravel pack in place. The gravel may be held in the annular space between two sizes of perforated pipe, or it may be held as a sheath around a common liner by means of wire screen.

NEW GRAVEL MIXER

The handling of fluid with which gravel is placed in wells has been greatly improved. Instead of adding the gravel in intermittent batches, it is usually added in a continuous-process mixer, thus leaving less chance for bridging on the way down. Bridging is most likely to occur where the top of the liner projects up into the casing. In some instances the final string of casing has been installed with several joints of larger-sized pipe at the bottom of the string to avoid this restriction.

Calcareous material is sometimes added to the mud used for placing the gravel. In this case acid is used after the pack has been washed with water in order to insure removal of the mud. It has been suggested that oil would offer certain advantages for placement of gravel.

(Continued on Page 245)

bería de perforación, la cual lo soporta por arriba o por el fondo. Cuando el tubo está suspensido por arriba, se emplea entonces un tipo especial, forrado con un manguito de cemento. Este manguito cierra las perforaciones o ranuras, de modo que el líquido de circulación es obligado a pasar alrededor de la zapata del tubo. Después de colocada la grava, el manguito de cemento se perfora para abrir las perforaciones.

Generalmente el tubo está soportado por el fondo, por medio de una tubería que se extiende de la tubería de perforación, pasando por el tubo y atornillándose en una placa al fondo, provista de rosca izquierda. En este caso, el manguito de cemento del tubo no es esencial, pero se emplea a menudo, como protección adicional contra la obturación de las perforaciones durante la instalación. Cuando se bajan tubos largos, con manguitos de cemento, lo corriente es soportarlos en la base, para evitar la posibilidad de daño, a consecuencia de estiramiento. Arriba del tupo, una tapa en la tubería de perforación evita que la grava se meta entre el tubo y la tubería. Se emplean aletas de acero, en la parte exterior del tubo, para centrarlo en la tubería.

Durante la colocación de la grava, el tubo se mantiene levantado del fondo, uno o dos piés, mientras se inyecta lodo en la parte exterior del vástago de perforación, empleando un enganche especial en la superficie. La grava se añade a la corriente de lodo en porciones de 5 a 10 piés cúbicos. El lodo consiste sólo en material coloidal y agua. Debe ser de suficiente viscosidad para llevar grava, y al mismo tiempo, prestarse a fácil lavado cuando se coloca en su sitio la grava. La viscosidad Stormer de 25 a 35 ha resultado satisfactoria.

El lodo con la grava va al fondo del pozo, afuera del tubo, pasa por un tapón ciego perforado y sube luego a la superficie, por la tubería. La grava se acumula afuera del tubo. Se usa suficiente grava para rellenar el espacio calculado, más 10%, para tapar las irregularidades y el espacio del tubo ciego.

Cuando la grava está en su sitio, la circulación de agua entra a reemplazar a la circulación de lodo, y aquella se mantiene hasta que el agua de regreso a la superficie sale limpia. Girando hacia la izquierda la tubería de perforación, se suelta el tubo. En la tubería de perforación se usa una barrena para quitar el manguito de cemento del tubo.

Los recientes trabajos de empaque con grava favorecen el uso de un agujero comparativamente pequeño para el tubo, por lo general, de menos de 15" de diámetro. Este desarrollo es importante porque realiza un resultado muy apetecido en el sentido de tapar la arena, pues se ha visto que un empaque de 2" de grava bien escogida, es suficiente para asegurar esta protección. Un agujero más grande tiene una ventaja natural, pero, por otra parte, un agujero grande a menudo aumenta la inversión en el pozo, en muchos casos, hasta un 50%.

Con agujeros más pequeños en uso, el problema de centrar el tubo, de modo que el espesor de grava en todos sus lados, sea igual, se hace más inminente. Se han introducido resortes de centración, de acero, que se comprimen, al pasar por la tubería, y se extienden luego contra las paredes del agujero agrandado.

Un tipo de tubo se baja al agujero llevando en su sitio el empaque de grava. La grava puede sujetarse en el espacio anular entre dos tamaños de tubo perforado, o puede sujetarse, en la forma de cubierta alrededor de un tubo ordinario, mediante una malla de alambre.

NUEVO MEZCLADOR DE GRAVA

El manejo del líquido con que la grava se coloca en su sitio en los pozos, ha sido notablemente mejorado. En lugar de agregar la grava en porciones intermitentes, se añade ordinariamente en un mezclador de procedimiento contínuo, reduciéndose así el peligro de amontonamiento. La posibilidad de amontonamiento se presenta principalmente en el punto donde la parte superior del tubo se proyecta dentro de la tubería. En algunos casos, la tubería final ha sido instalada con varias juntas de tubos de mayor tamaño al fondo, a fin de evitar esta restricción.

A veces se añade material calcáreo al lodo empleado para la colocación de la grava. En este caso se emplea ácido, después de lavado con agua el empaque, para asegurar la remoción del lodo. Se ha dicho también que el petróleo podría ofrecer ciertas ventajas para la colocación de la grava.

POZOS BROTANTES

En los primeros tiempos del prorrateo, se asumía que una menor cantidad de descarga conduciría inevitablemente a una mayor extracción. En épocas más recientes se ha visto que las descargas de régimen moderado son, a menudo, muy derrochadoras de presión de depósito. Se sabe ahora que la descarga o brotadura libre y la restringida grandemente, resultan, en mabos casos, en una disipación innecesaria de la presión de depósito. Entre estos dos extremos existe seguramente un régimen racional, que varía, hasta cierto punto, según el caracter de los pozos, en cuyo punto se reduce a un mínimo el derroche de la presión del gas del depósito.

Un escape infinitamente pequeño por la válvula de una botella de agua gaseosa, permitirá, con el tiempo, que se escape todo el bióxido de carbono disuelto, dejando finalmente en la botella un líquido sin un átomo de gas. Cuando los pozos brotantes, de gran rendimiento, se restringen a una producción de sólo

(Continue en Pagina 245)

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FLOWING WELLS

In the early days of proration it was assumed that a low rate of flow would lead inevitably toward greater recovery. More recently it has been found that low rates of flow are often very wasteful of reservoir pressure. It is now known that both open-flow production and too greatly restricted production result in needless dissipation of reservoir pressure. Somewhere between these two extremes exists a rate, varying to some extent for different wells, at which the release of gas pressure from the reservoir is held to the minimum.

An infinitely small leak in the valve of a charged-water bottle will permit all of the dissolved carbon dioxide to escape, leaving the bottle full of lifeless fluid. When large-capacity flowing wells are pinched back so that they will produce only 5 or 6 bbl. per hour through 2½-in. tubing, then the above most wasteful condition is being closely approached. Velocity of flow is so low that the tubing acts as an oil-and-gas separator; and if we listen at the well head, we may hear occasional "slugs" of oil passing through the surface choke, punctuating long intervals of gas escape.

Since expanding gas is the lifting force in a flowing well, the efficiency of flow can be gaged simply by determining the volume of gas released from the reservoir with each barrel of oil produced. Rate of flow has a profound effect on gas-oil ratio, and it can be regulated with little or no expense to the operator. Flow rates need not be governed by daily allowable production. When allowables are low, the flowing wells can be produced for a few hours each day at the most favorable rate of flow. Shutting the well in for part of the day is usually far more desirable than flowing it continuously at a wasteful production rate.

LOW FLOW RATES WASTEFUL

Gas-oil ratio tests made on a typical 4,300-ft. flowing well equipped with 2½-in. tubing revealed that more than twice as much gas was required to produce oil at the rate of 5 bbl. per hour than at the rate of 40 bbl. per hour. Open flow through the tubing required only 50 per cent more gas per barrel than was required at the optimum rate of 40 bbl. per hour. Generally speaking, any flow rate below 25 bbl. per hour was found to show a sharp increase in flowing gas-oil ratio. Using 2-in. tubing it was found that this sharp increase in gas-oil ratio was brought about by reducing the rate of flow below 15 bbl. per hour.

The optimum rate of flow for gas conservation will vary somewhat from well to well. Each flowing well should be tested at regular intervals to determine the most desirable rate, for only in this way can the well be given its maximum flowing life. However, gas-oil-ratio tests, if properly made, require considerable time. Also, since gas production at low rates of flow may be very small, it must be measured with an accurate orifice meter in order to avoid errors that will obliterate the sharp rise in gas-oil ratio for these low rates. If, then, it is found to be impractical to make gas-oil-ratio tests, the most wasteful conditions can still be avoided by using data from other wells to choose a minimum rate of flow. This adopted minimum rate can then be adhered to as long as the well is capable of flowing at that rate.

PUMPING WELLS

In his paper, "Application and Selection of Pumping Units," H. W. Ramey classifies all pumping wells in three groups. These are: agitators, semiagitators, and true pumpers. An agitator is a well that will flow through the tubing when it is agitated by the pump plunger and the rods. A semiagitator will respond part of the time to agitation while the remainder of the time it acts as a true pumper. In a true pumper, gas offers no appreciable assistance to the mechanical pumping mechanism.

The typical well in its normal life passes from the flowing stage to the agitating stage, then to the semiagitator stage and finally to the true pumping stage. The dominant factor causing this transition is gas.

In an agitating well a gas anchor is never beneficial and sometimes it actually interferes with production. Gas separation is not wanted, since gas expansion in the tubing represents the chief lifting force. In any case, it is improbable that a gas anchor would function in an agitator well. The fluid level must be high for efficient agitation, and gas under a high hydrostatic head is likely to be in solution in the oil and, therefore, not susceptible to separation.

AGITATOR WELLS

When a well is of the agitator group, the pump should be set close to bottom. Spacing of valves is not important. The casing head should be kept closed tightly to prevent waste of gas, or a packer should be set between the tubing and casing. A short fast pumping stroke is considered most effective. An efficient agitator should produce as much or more than the plunger displacement. In some cases there is sufficient gas present to blow the tubing and pump dry periodically. This is undesirable because the pump may gall due to lack of fluid. Such a condition can often be overcome by placing a regulator on the lead line and carrying a constant back pressure on the tubing head.

SEMIAGITATORS

When a well is in the semiagitator class, it is usually troublesome. The gas production is insufficient for continuous flow by agitation and it usually interferes with pump operation.

In many semiagitator wells pound occurs on the downstroke due to gas lock. This is easily mistaken for a fluid pound which would indicate that the well was pumping off. A test with one of the recently introduced meth-

(Continued on Page 250)

5 o 6 barriles por hora, a través de una tubería de 2½", se repite entonces aquí, el gran derroche que acabamos de señalar en la botella de agua gaseosa. La velocidad de la descarga es tan lenta, que la tubería actúa entonces como un separador de petróleo y gas. En efecto, si ponemos el oído en la cabeza del pozo, escucharemos, de vez en cuando, porciones de petróleo pasando por el estrangulador, dando puntuación a largos intervalos de escape de gas.

Como el gas en dilatación es la fuerza de levantamiento en un pozo brotante, el rendimiento de la descarga podrá calcularse sencillamente determinando la cantidad de gas que sale del depósito o yacimiento, con cada barril de petróleo extraído. El régimen o velocidad de la descarga tiene un efecto profundo sobre la relación de gas y petróleo, y puede regularse con poco o ningún gasto para la empresa explotadora. Los régimenes de descarga no necesitan gobernarse por las asignaciones de producción diaria. Cuando las asignaciones de producción diaria son bajas, los pozos brotantes pueden regularse a unas pocas horas de producción al día, al régimen de descarga más favorable. El cerrar el pozo, durante parte del día, es, por lo general, más ventajoso que dejarlo abierto, continuamente, con un régimen de producción derrochador.

EL REGIMEN DE DESCARGA LENTA ES DERROCHADOR

Ensayos de la relación de gas y petróleo, emprendidos en un típico pozo brotante, de 4300 piés, equipado con tubería de 2½", revelaron que se requería dos veces más gas para la producción de petróleo, a razón de 5 barriles por hora, que a razón de 40 barriles por hora. La descarga libre por la tubería necesitaba sólo 50% más gas, por barril, que la requerida al óptimo régimen de 40 barriles por hora. En términos generales, todo régimen de descarga o producción, de menos de 25 barriles por hora, se vió que mostraba un gran aumento en la relación de gas y petróleo descargados. Usando una tubería de 2", se vió que este gran aumento en relación de gas y petróleo se producía reduciendo el régimen de descarga a menos de 15 barriles por hora.

El óptimo régimen de descarga, para la conservación del gas, varía un tanto, de pozo a pozo. Cada pozo brotante debería ensayarse periodicamente, a fin de determinar su régimen de descarga más conveniente, pues esta es la única manera de asegurar su máxima duración productiva. Los ensayos de relación de gas y petróleo, sin embargo, consumen mucho tiempo, para que resulten bien hechos. For otra parte, como la producción de gas, a régimen de lenta descarga, puede ser muy pequeña, conviene entonces medirla con contador de orificio muy exacto, para evitar errores, que pudieran borrar los grandes aumentos en relación de gas y petróleo que corresponden generalmente a los régimenes de descarga lenta o restringida. Cuando no resulte práctico hacer ensayos de relación de gas y petróleo, será entonces posible evitar todavía las peores condiciones de derroche, utilizando los informes o datos de otros pozos, para elegir de esta información, un conveniente régimen de descarga limitada o mínima. Este régimen de descarga mínima adoptado podrá ser seguido durante todo el tiempo en que el pozo a que se aplica puede convenientemente producir a esa descarga.

POZOS DE BOMBEO

En su estudio sobre "la aplicación y selección de equipo de bombas," H. W. Ramey clasifica todos los pozos de bombeo, en los tres grupos siguientes: agitadores, semiagitadores y verdaderos pozos de bombeo. Un agitador es un pozo produce por la tubería cuando es agitado por el émbolo o pistón de la bomba y sus varillas. El semiagitador responde a la agitación, parte del tiempo, y actúa como uno verdadero de bombeo, el resto del tiempo. En un verdadero pozo de bombeo, el gas no ofrece ninguna resistencia apreciable al funcionamiento del mecanismo de la bomba.

El pozo típico, en su vida normal, pasa del estado de brotación, al estado de agitación, luego al de semiagitación y finalmente al verdadero estado de bombeo. El factor dominante, que causa esta transición, es el gas.

En un pozo de agitación, el anclaje del gas nunca resulta beneficioso y a veces perturba o dificulta la producción. No se necesita separación de gas, a causa de que la dilatación o espansión del gas en la tubería representa la principal fuerza de levantamiento. En todo caso, es improbable que pueda funcionar bien un anclaje de gas instalado en el tipo agitador. El nivel del líquido debe ser alto para una agitación eficaz, y el gas, bajo una gran presión hidrostática, está propenso a estar en solución con el petróleo, y por esta razon, insusceptible a separación.

POZOS DE AGITACION

Cuando el pozo es del tipo de agitación, la bomba debe colocarse cerca del fondo. La distancia entre las válvulas no es importante. La cabeza de la tubería debe mantenerse hermeticamente cerrada, para evitar el desperdicio del gas, o un obturador debe colocarse entre la tubería y el tubo. Una carrera corta y rápida de bomba se considera la más efectiva. Un eficaz pozo de tipo agitador debería producir tanto, o más, que el desplazamiento del émbolo. En algunos casos, hay presente suficiente gas para secar, por sopladura, la tubería y la bomba, periodicamente. Esto no es conveniente, pues la bomba puede rasparse, por falta de flúido. Semejante condición puede, a menudo, evitarse, colocando un regulador en la línea principal y

(Continue en Pagina 250)

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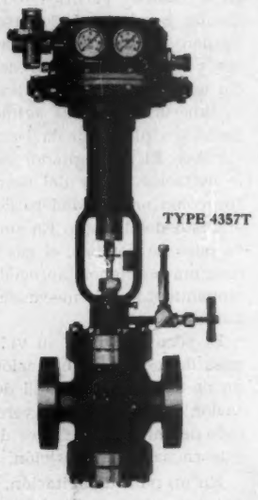
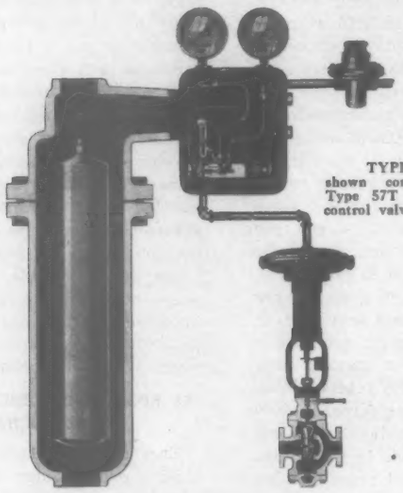
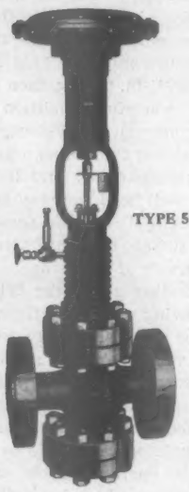


TYPE 4357T



TYPE 246 shown connected to Type 57T Diaphragm control valve.



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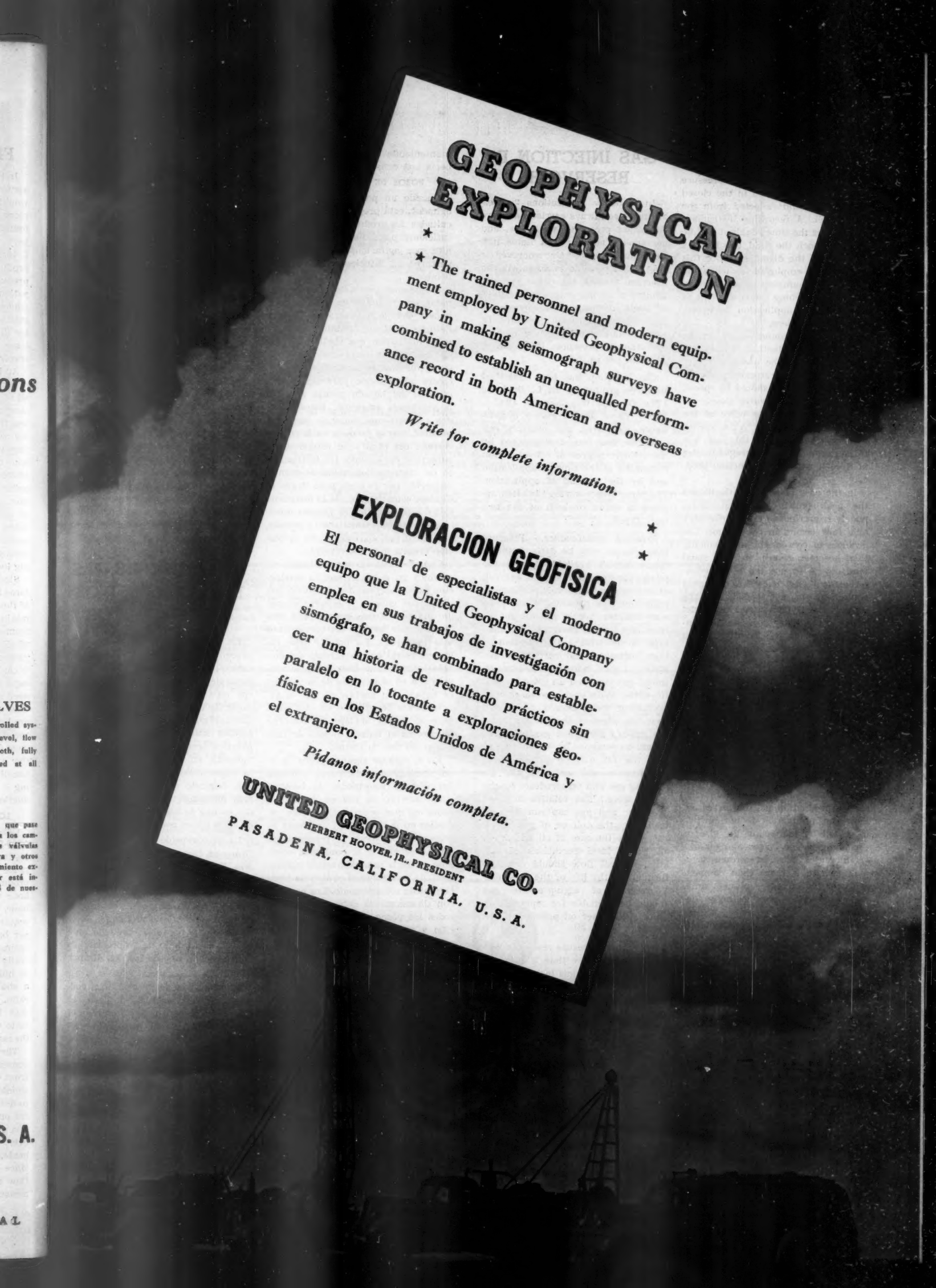
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ods of determining fluid level will quickly reveal the truth. These methods make use of a sound or pressure wave which is created in the closed casing head and reflected from the fluid level. A recording instrument determines the time required for the wave to reach the fluid, this being a function of the distance. Since this principle is employed, either while the well is pumping or shut down, without disturbing the equipment at the well, its application is exceptionally convenient.

When a gas pound occurs on the downstroke, production can usually be increased by the use of a larger pump with a longer stroke and slower motion. The pump should be spaced so that the plunger valve closely approaches the standing valve at the end of the downstroke. A gas anchor is usually beneficial in this case, but if the gas anchor is submerged too far in fluid it will fail to function properly.

In the case of some semiagitators the peak polished-rod load varies widely from time to time, since periodic flow occurs in the tubing. The problem of correct counterbalancing then becomes severe, and the usual tendency is to use too much counterbalance so that the pumping equipment is overloaded on the downstroke. Dynamometer tests must be made at all stages of the fluctuating cycle, and the counterbalance must be adjusted to the mean load.

TRUE PUMPERS

True pumpers respond to the pump as if a gasless fluid were being pumped. Gas present is separated out by a gas anchor before entering the pump. Within reasonable limitations the true pumper will conform to engineering formulas for calculation of production and polish-rod load. If the pump displacement is increased by lengthening the stroke, production will be increased. However, production is not always increased by increasing the size of the plunger. The larger plunger often increases the rod stretch to a point where it more than compensates for the increased plunger area, and production may actually decrease.

On true pumpers of great depth the chief problem is one of selecting optimum conditions to bring about the lowest possible peak loads. Use of a dynamometer for testing the effect of various speeds and counterbalance adjustments is of great value.

When selecting or operating pumping equipment, it is well to keep in mind the class to which the well in question belongs, for this has a fundamental effect on the results to be expected. However, it is necessary to remember that practically all wells become true pumpers for the larger portion of their lives, and equipment should be selected accordingly. In the Mid-Continent area it is history in all fields that polish-rod loads have increased steadily with the aging of the field.

GAS INJECTION IN RESERVOIRS

In its early applications "repressuring" was always carried on where formation pressures were low, and compressed air was used. Later, natural gas replaced air wherever it was found possible to do so. As the practice proved successful, it was applied at earlier stages in the lives of pools, meeting with correspondingly higher formation pressures. In some instances projects are now in operation at pressures in excess of 4,500 lb. per sq. in.

Gas injection has been classified in three groups by H. L. Baldwin. (The Oil and Gas Journal, Oct. 5, 1939.) These are: Pressure maintenance, gas drive, and pressure restoration. They are distinguished by the relative degree of oil saturation remaining at the time of application and by the method of application. The term "repressuring" is often applied to either or both of the two later types.

Pressure maintenance. — Pressure maintenance may be defined as the return of all available gas to the producing formation so that as much of the original reservoir pressure is maintained as possible. While pressure maintenance is suitable for almost any type of reservoir, the ideal type is one with a sand section of high horizontal and vertical permeability, a good structural closure, an initial gas cap, and an effective water drive. With such a reservoir all producing wells should be drilled near the edges of the pool to avoid the gas-cap area. The gas produced should be returned to the gas cap so that the oil will be driven down structure to the wells by the expanding gas and up structure by the water drive. The relative advance of water and gas cap can be controlled by the volume of gas injected and by the rate of oil withdrawal. Under ideal conditions of this kind, natural flow should continue throughout the life of the pool, and a reserve of high-pressure gas should be available for repressuring other fields after oil production has ceased.

Gas returned to the reservoir will occupy more space than it originally did as solution gas in the oil, but this increase in volume will be insufficient to compensate for the volume of oil removed and for the gas used for operating purposes. Therefore, there will be a gradual decline in reservoir pressure during operation unless there is an effective water drive or unless gas from another source is injected.

In fields where no gas cap exists, pressure maintenance is even more desirable than otherwise because less natural energy is available for expulsion of fluid. The oil will probably be undersaturated with gas. It is improbable that any appreciable volume of the injected gas will go

manteniendo en la cabeza de la tubería una constante contrapresión.

POZOS DE SEMIAGITACION

Cuando un pozo es de tipo semiagitador, está propenso a causar dificultades. La producción de gas es insuficiente para una corriente contínua, por agitación, y generalmente perturba el funcionamiento de la bomba.

En muchos pozos de tipo semiagitador, ocurre golpe en la carrera de bajada, debido a obturación de gas. Esto se confunde facilmente con un golpe de líquido, que significaría que el pozo estaba bombeando. Un ensayo con uno de los métodos de reciente introducción para determinar el nivel del líquido pronto revelará la verdadera situación. Estos métodos utilizan una onda de sonido o presión, que se produce en la cabeza cerrada del tubo y se refleja de la superficie del líquido. Un instrumento de registro determina el tiempo requerido por la onda para llegar al líquido, calculándose así la distancia. Como este principio se emplea mientras el pozo está trabajando o parado, sin perturbar su equipo, su aplicación resulta muy conveniente.

Cuando en la carrera de bajada se produce un golpe de gas, la producción puede aumentarse entonces, por regla casi general, mediante el uso de una bomba más grande, con una carrera más larga y un movimiento más moderado. La bomba debe colocarse modo que la válvula del émbolo se aproxime bastante a la válvula fija en el extremo de la carrera de bajada. Un anclaje de gas es generalmente beneficioso en este caso, pero si el tal anclaje se sumerge mucho, en el líquido, dejará de funcionar en debida forma.

En el caso de algunos pozos de tipo semiagitador, la carga máxima del vástago intermedio de bombeo varía mucho, de vez en cuando, a causa de que ocurre circulación periódica en la tubería. El problema de correcto contrapeso se presenta entonces, severo, y la tendencia corriente es hacia usar demasiado contrapeso, de modo que el equipo de bombeo queda sobrecargado. Los ensayos con dinamómetro deben hacerse en todos los pasos del ciclo de fluctuación y el contrapeso debe ajustarse a la carga promedia.

POZOS DE VERDADERO BOMBEO

Los pozos de verdadero bombeo responden a la bomba como si el líquido por bombearse no contuviera gas. El gas presente es separado por un anclaje de gas, antes de entrar a la bomba. Dentro de límites racionales, el pozo de verdadero bombeo concueda con las fórmulas técnicas en lo tocante a cálculo de producción y carga de vástago intermedio de bombeo. Cuando se aumenta el desplazamiento de la bomba, alargando la carrera, crece la producción. Sin embargo, no siempre crece la producción mediante un aumento del tamaño del émbolo. El émbolo más grande a menudo aumenta el estiramiento del vástago hasta un punto en que más que compensa la superficie aumentada del émbolo y en tal caso hasta puede reducirse la producción.

En los pozos de verdadero bombeo, de gran profundidad, el problema principal es el de elegir las condiciones óptimas, a fin de establecer las menores cargas máximas posibles. El uso del dinamómetro para ensayar el efecto de varias velocidades y ajustes de contrapeso, es de gran valor.

Al elegir o al usar equipo de bomba, bueno es tener muy presente la clase a la cual pertenece el pozo del caso, pues esto tiene un efecto fundamental sobre los resultados que se esperan. Sin embargo, es necesario recordar que casi todos los pozos se convierten en verdaderos de bombeo, durante la mayor parte de su duración productiva, y el equipo deberá, por lo tanto, ser elegido teniendo presente esta circunstancia. En la región central, la historia de todos los campos registran el hecho de que las cargas del vástago intermedio de bombeo han aumentado continuamente con la mayor edad de la explotación.

INYECCION DE GAS EN LOS DEPOSITOS O YACIMIENTOS

En sus primeras aplicaciones, el procedimiento de represión se aplicaba a formaciones, cuyas presiones naturales eran bajas, y se efectuaba con aire comprimido. Más tarde, en lugar de aire comprimido se empleó gas natural, en todo caso en que era posible hacerlo. Como esta última práctica resultó satisfactoria, fué aplicada, en las primera etapas de la explotación de yacimientos nuevos, llegando a hacerse a presiones más elevadas. Actualmente hay casos en que se usan presiones de más de 4.500 libras por pulgada cuadrada.

La inyección de gas ha sido clasificada en tres grupos por H. L. Baldwin. Estos grupos son: conservación de presión, impulsión de gas y restauración de presión. Se distinguen por el grado relativo de saturación de petróleo restante al tiempo de la aplicación y por el método de aplicación. El término de "represión" se aplica a cada uno de los dos últimos tipos.

Conservación de presión.—La conservación de presión puede definirse como el regreso o retorno de todo el gas disponible a la formación productiva, a fin de que pueda mantenerse lo más que se pueda de la presión original del yacimiento. Aunque la conservación de presión es adaptable a casi todo tipo de depósito o yacimiento, el ideal de todos es aquel con una sección arenosa de gran permeabilidad horizontal y vertical, una buena cerradura estructural, una tapa inicial de gas y una efectiva impulsión de agua. Con un yacimiento de este tipo, todos los pozos de producción deben perforarse cerca de

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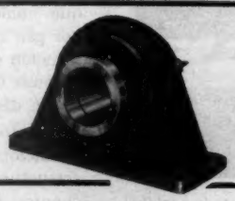

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into solution in undersaturated oil because the degree of contact will be limited.

Most pools exhibit some conditions such as low structural relief, low permeability, frequent shale breaks, or other conditions that will work to the disadvantage of pressure maintenance. However, gas injection is usually justified by greater recovery and by conservation of gas.

Increasing the ultimate recovery is the most common cause for adoption of pressure maintenance. During early years of application few figures were available to show results obtained. Now at least one case can be cited to show that pressure maintenance is desirable economically and that it is a technical necessity. With production methods usually employed, the normal expectancy from one 11-year-old field in North Central Texas was 7,500,000 bbl. Pressure maintenance was instituted early in the life of the pool with the result that 13,600,000 bbl. of crude has already been produced. Under improved producing conditions the expected ultimate recovery is now 21,000,000 bbl., or nearly three times that which had been expected under usual methods.

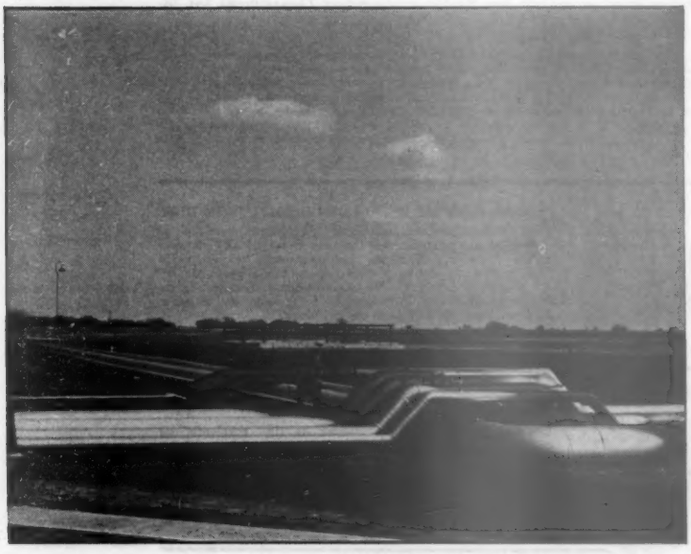
Pressure maintenance in condensate pools.—It has been found in many high-pressure pools in Texas and Louisiana that mixtures of hydrocarbons under certain conditions of pressure and temperature exist in the reservoir entirely in the gas phase, and yet they produce a liquid, termed a condensate, when the pressure is reduced in a surface processing plant. The contention that these hydrocarbons exist underground as gas has been borne out by a series of attempts to get liquid samples with bottom-hole sampling devices. Condensation of the liquid, as brought about by drop in pressure, has recently been termed "retrograde condensation," although the phenomenon was known for years before the term was introduced.

The type of condensation known as "retrograde" is said to differ from that type of condensation typical of gas wells in the Texas Panhandle, where natural gasoline is condensed from the natural gas. The pressure range for retrograde condensation is much higher and condensation can take place when either the temperature or the pressure is lowered. When gas is produced from pools of lower pressure, drop in temperature is the only factor contributing to condensation, while pressure drop has the opposite effect.

Since temperature drop always accompanies the pressure drop that occurs when gases are released from a reservoir, the retrograde phenomenon is not a practical necessity in the stripping-plant operation that is always carried on in conjunction with production of a condensate pool. That is, condensation could be brought about in the stripping plant solely by temperature reduction without the aid of the retrograde effect. Retrograde condensation is given its most serious consideration because of its possible effect upon production. If pressure drop without temperature change can cause condensation of liquid at the surface, the same effect is to be expected in the reservoir. If, then, the reservoir pressure is allowed to drop due to removal of gas, condensation may occur within the reservoir, and a large part of the condensate will not be brought to the surface. The desire to prevent this premature condensation has greatly stimulated interest in pressure maintenance.

Since very little pressure drop is allowed in condensate pools, it may

(Continued on Page 256)



The old practice of burying all lines at tank batteries and gasoline plants is rapidly being replaced by neat arrangements of painted surface lines

La antigua práctica de enterrar todas las líneas de tubería en los depósitos y destilerías o fábricas de gasolina, se está suplantando, rapidamente, por agradables arreglos de tuberías exteriormente pintadas

los bordes del depósito, para evitar la zona de la tapa de gas. El gas producido debe devolverse a la tapa de gas, para que el petróleo sea obligado a bajar por la estructura y pasar a los pozos, por la dilatación del gas, y luego subido por la impulsión de agua. El avance relativo del agua y del gas puede gobernarse por la cantidad de gas inyectada y por la cantidad de petróleo salida. Bajo las condiciones ideales de esta clase, la corriente natural debería continuar durante la vida del yacimiento, y debería existir una reserva de gas de alta presión para el trabajo de represión en otros campos, después de cesada la producción de petróleo.

El gas devuelto al yacimiento ocupará más espacio que el que tenía originalmente cuando estaba disuelto en el petróleo, pero este aumento de volúmen no será suficiente para compensar el volúmen del petróleo quitado y del gas utilizado para otros fines de trabajo. Por esta razón, habrá una reducción gradual de presión de yacimiento, durante la explotación, a menos que se recurra a una efectiva impulsión o inyección de agua, o a la introducción de gas proveniente de otra fuente.

En los campos donde no hay tapas o salidas de gas, la conservación de la presión es todavía más conveniente, que de otro modo, a causa de que hay menos energía natural disponible para la expulsión del líquido. El petróleo estará probablemente subsaturado de gas. Es improbable que cualquiera cantidad apreciable del gas inyectado vaya a entrar en solución con el petróleo subsaturado, a causa de que será limitado el grado de distancia.

Casi todos los depósitos presentan condiciones tales como bajo relieve estructural, poca permeabilidad, frecuentes interrupciones de esquistos arcillosos y otras que resultan desventajosas a la conservación de presión. Sin embargo, la inyección de gas se justifica ordinariamente por la mayor recuperación y por la conservación del mismo gas.

El aumento de la recuperación o producción final es la razón principal para la adopción de la conservación de la presión. Durante los primeros años de la aplicación, muy pocos fueron los informes disponibles, para mostrar los resultados obtenidos. Ahora se puede citar, por lo menos, un caso, para mostrar que la conservación de presión es conveniente, desde el punto de vista de la economía, y que es también una necesidad técnica. Con los métodos de producción que ordinariamente se siguen hoy en día, el rendimiento normal anticipado para un campo de 11 años de explotación en North Central Texas, fué calculado en 7.500.000 barriles. La conservación de presión fué instituida a principios de la explotación de este campo, con el resultado de que el rendimiento, hasta la fecha, ha sido de 13.000.000 de barriles de petróleo crudo. Bajo condiciones de producción mejoradas, el rendimiento total final se espera que será de 21.000.000 de barriles, es decir, cerca de tres veces mas que el resultado anticipado, según los métodos corrientes.

Conservación de presión en depósitos de condensados.—Se ha visto en muchos yacimientos de alta presión, en Texas y Luisiana, que las mezclas de hidrocarburos, bajo ciertas condiciones de presión y de temperatura, existen en el depósito enteramente en la fase gaseosa, mas, a pesar de esto, producen un líquido, llamado condensado, cuando la presión es reducida en la instalación de conversión. La contención de que estos hidrocarburos existen en depósitos subterráneos, en forma gaseosa, ha sido confirmada por varios experiementos para obtener muestras líquidas con dispositivos a propósito. La condensación del líquido, resultante de la reducción de presión, ha sido recientemente llamada "condensación retrógada," a pesar de que este fenómeno se conocía desde hace muchos años con antelación a la introducción de esta designación técnica.

El tipo de condensación "retrógada" se dice que es diferente del tipo de condensación característico de los pozos de gas en la región Texas Panhandle, donde la gasolina natural se condensa del gas natural. La escala de presión, para la condensación retrógada, es mucho más alta, y la condensación puede efectuarse cuando se reduce la temperatura o la presión. Cuando se produce gas de depósitos de menor presión, la bajada de la temperatura es el único factor que contribuye a la condensación, mientras que la caida de presión tiene precisamente el efecto contrario.

Como la bajada de la temperatura siempre acompaña a la caída de presión que ocurre cuando los gases salen del depósito o yacimiento, el fenómeno de la condensación retrógada no es una necesidad práctica en el trabajo de destilación que siempre se lleva a cabo en combinación con la producción de un yacimiento de condensado. Es decir, la condensación puede efectuarse en la destilería, nada más que por la reducción de temperatura, sin la ayuda del efecto retrógado. La condensación retrógada ha merecido especial consideración en vista de su posible efecto sobre la producción. Si la caída de presión, sin cambio de temperatura, puede causar la condensación del líquido en la superficie, es de esperarse que se repita el mismo efecto en el depósito o yacimiento. Tenemos, entonces, que si se permite que baje la presión en el yacimiento, debido a la remoción del gas, se producira condensación dentro del yacimiento, y una gran parte del condensado no saldrá a la superficie. El deseo de evitar esta condensación prematura ha estimulado mucho el interes en la conservación de la presión.

Como se permite muy poca caída

(Continue en Pagina 256)

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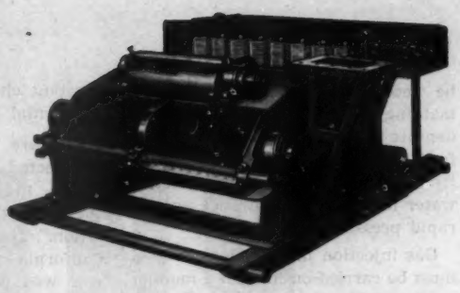

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be necessary to return all gas remaining after extraction of the condensate to the reservoir, using gas from some other source, or electricity, for lease operations. An effective water drive offers insurance against rapid pressure decline.

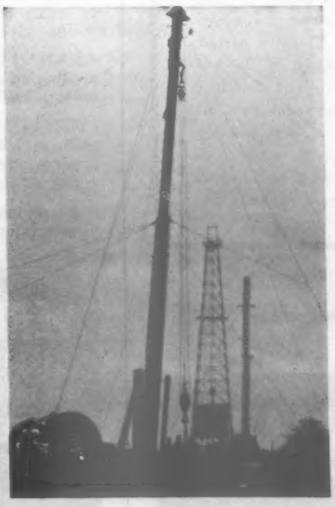
Gas injection in a condensate pool must be carried on in such a manner as to avoid channeling of injected dry gas to producing wells. Such channeling results in unprofitable recycling and in exclusion of the rich native gas from the producing wells. Prevention of channeling may prove difficult, as the small difference in weight of wet and dry gas will not assist in maintaining separation. In practice, the rate of production from condensate pools must be governed almost solely by ability to avoid channeling.

Gas drive.—When gas is injected into an old pool for the purpose of driving oil to the producing wells, the term "gas drive" is used. Usually gas drive is applied when the liquid saturation of the oil sand has been reduced to a small portion of its original value, and oil must be moved by a viscous drag rather than by displacement. Experience has shown that oil production will increase with increased gas input up to a certain limit, beyond which an increase in gas may decrease production. Further increases will cause excessively high producing gas-oil ratios, indicating channeling. It is probable that oil is continually moving into the permeable channels from the adjacent tighter sands, but too much gas injection will decrease or reverse the pressure differential. In some Pennsylvania fields intermittent injection of gas has been exceptionally beneficial where channeling has been encountered. During the period between injections, the channels are invaded by oil from the adjacent tight sands, and this oil is moved to the producing wells when the gas is turned on. Long before intermittent injection of gas was introduced in Pennsylvania, it was noted by the writer, in operating a gas-drive system in the Texas Panhandle, that any variation either in volume of gas injected or in back pressure on the producing wells resulted in an increase in production. However, when the same variation was repeated several times, it lost its effectiveness. It seems quite likely that the average gas-drive affects a very small portion of the reservoir. With uniform injection and uniform back pressures the system becomes fixed in its underground position. Changes in injected gas volume or in back pressure tend to change the pressure differentials in the various parts of the reservoir, thereby broadening the effect of the gas injection. In other words, it is believed that the present common practice of determining the optimum rate of gas injection and establishing this as a uniform rate should be discarded in favor of a system of constant change, at least on an experimental basis.

Pressure restoration. — When gas is injected into an old pool to increase the average pressure, the operation is termed "pressure restoration." The first application was in California where an old oil reservoir was used purely for the purpose of storing natural gas. In nearly all early applications, gas conservation was the underlying reason, but results obtained have justified projects on which increased oil recovery was the primary reason.

Pressure restoration has an advantage over gas drive in that the effects of permeability differences are minimized. Gas is forced into the tighter portions of the sand, and when it is allowed to expand, a portion of the oil is discharged. Disadvantages include a larger gas requirement, greater investment with deferred pay-out, and the necessity of restricting or discontinuing production during the period in which pressure is being built up.

Water flooding. — A small water-flooding project was recently started by Shell Oil Co., Inc., in the Nowata field of Oklahoma which is unusual because of its simplicity. All water for nine input wells is furnished by a single water well which was drilled to a prolific water sand occurring several hundred feet below the oil sand. A submersible electric centrifugal pump is located in the bottom of the water well, and this furnishes all the power necessary both for lifting the water and for injecting it into the input wells. The electric centrifugal pump in the well is operated by purchased power supplied to the submerged motor by a cable. The entire water-flooding system is enclosed, and under these conditions it was found that the only water treatment necessary was addition of a small quantity of chemical for prevention of acid formation. Due to low installation costs, a comparatively small production increase will mean profitable operation of the water-flooding plant.



de presión en los yacimientos o depósitos de condensados, podrá hacerse necesario el regreso al depósito de todo el gas que quede después de la extracción del condensado, usando gas de otras fuentes, o electricidad, para los trabajos exteriores de la explotación. Una efectiva propulsión de agua ofrece un medio seguro contra la caída o reducción de la presión.

La inyección de gas en un depósito de condensados debe hacerse de modo de evitar que se acanale el gas seco inyectado, a los pozos en producción. Esta transmisión resulta en un tratamiento improductivo y en la exclusión del rico gas nativo de los pozos en producción o brotantes. Puede resultar bien difícil evitar esta canalización o transferencia, pues la pequeña diferencia de peso entre el gas seco y el gas húmedo no ayuda a mantener su separación. En la práctica, el régimen de producción de los yacimientos de condensados debe gobernarse unicamente por la facultad para evitar la acanaladura.

Propulsión de gas.—Cuando se inyecta gas en un yacimiento viejo, con el objeto de propulsar o empujar el petróleo a los pozos de producción, se emplea el término de "propulsión de gas." Generalmente, se aplica propulsión de gas cuando la saturación líquida de la arena petrolífera ha sido reducida a una porción pequeña de su valor original, y el petróleo debe moverse por un arrastre viscoso, más bien que por desplazamiento. La experiencia ha mostrado que la producción de petróleo aumenta con la mayor inyección de gas, hasta un cierto límite, más allá del cual, un aumento en gas podrá disminuir el rendimiento o producción. Adicionales aumentos causarán relaciones de gas y petróleo excesivamente altas, indicativas de acanaladura. Es probable que el petróleo esté entrando continuamente en las vías o canales permeables, proveniendo de las arenas adyacentes más apretadas, pero la inyección de gas exagerada disminuirá o invertirá el diferencial de presión. En algunos campos de Pensilvania, la inyección intermitente de gas ha sido excepcionalmente beneficiosa en aquellos casos en que se ha presentado la acanaladura. Durante el período entre las inyecciones, las acanaladuras son invadidas por petróleo proveniente de adyacentes arenas apretadas, y este petróleo es movido a los pozos de producción cuando recibe el gas. Mucho antes de la introducción de la inyección intermitente de gas, en Pensilvania, el autor observó, mientras estudió el funcionamiento de un sistema de propulsión de gas en la región Texas Panhandle, que ninguna variación en volumen de gas inyectado o en contrapresión en los pozos de producción resultó en aumento de rendimiento. Sin embargo, cuando la misma variación fué repetida varias veces, ella perdió su efectividad. Parece que es muy posible que el promedio de las propulsiones de gas afecte sólo a una pequeña parte del yacimiento. Con inyección uniforme y con contrapresiones uniformes, el sistema queda fijo en su posición subterránea. Los cambios en volúmen de gas inyectado o en contrapresión tienden a cambiar los diferenciales de presión en las varias partes del yacimiento o depósito, ensanchando así el efecto de la inyección de gas. En otras palabras, se cree que la presente generalizada práctica de determinar el régimen óptimo de la inyección de gas y de establecer éste como la norma uniforme, debe abandonarse y en su lugar aceptarse el sistema de cambio constante, por lo menos, sobre una base experimental.

Restauración de presión.—Cuando se inyecta gas en un yacimiento viejo, para aumentarle su presión promedia, esto se llama "restauración de presión." La primera aplicación se hizo en California, donde un antiguo yacimiento de petróleo se usó exclusivamente para el almacenaje de gas natural. En casi todas las primeras aplicaciones, la conservación del gas fué la razón principal, pero los resultados obtenidos han justificado proyectos en que la mayor recuperación o producción de petróleo ha sido el propósito principal.

La restauración de presión tiene, sobre la propulsión de gas, la ventaja de que se reducen o decrecen los efectos de las diferencias en permeabilidad. El gas es inyectado en las porciones más apretadas de la arena, y cuando se dilata, desaloja parte del petróleo. Las desventajas que se presentan son: mayor requisito de gas, mayor inversión con beneficios postergados, y la necesidad de restringir o suspender la producción durante el período en que se está amplificando la presión.

Anegación con agua. Un pequeño proyecto de anegación con agua fué recientemente iniciado por la Shell Oil Co., Inc., en el campo de Nowata en Oklahoma, que es extraordinario, a causa de su extrema sencillez. Toda el agua de inyección para nueve pozos se suministra por un solo pozo de agua, perforado hasta una capa arenosa muy prolífica en agua, dispuesta a varios centenares de piés debajo de una capa de arena petrolífera. Al fondo del pozo de agua hay una bomba centrífuga eléctrica, de tipo sumergible, la cual suministra toda la fuerza necesaria para levantar el agua e inyectarla en todos los otros pozos. La bomba centrífuga eléctrica sumergida en el pozo funciona con corriente eléctrica, transmitida a su motor, por cable. El completo sistema de anegación con agua está tapado, y bajo estas condiciones, se vió que el único tratamiento que necesitaba el agua era la adición de una pequeña cantidad de substancias químicas para impedir la formación de ácido. Debido al bajo costo de instalación, un pequeño aumento de producción significa que este sencillo sistema de anegación con agua resulta lucrativo.

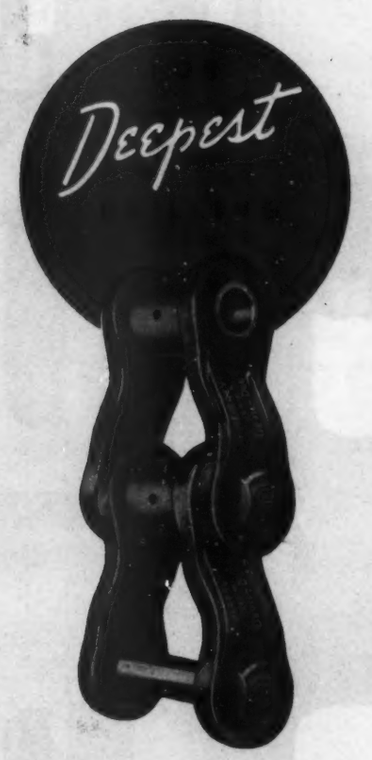
CHAINS

FOR OIL FIELD SERVICE

ROTOR CHIEF

RANGER

SINGLE OR DOUBLE STRAND



DEVIL DOG

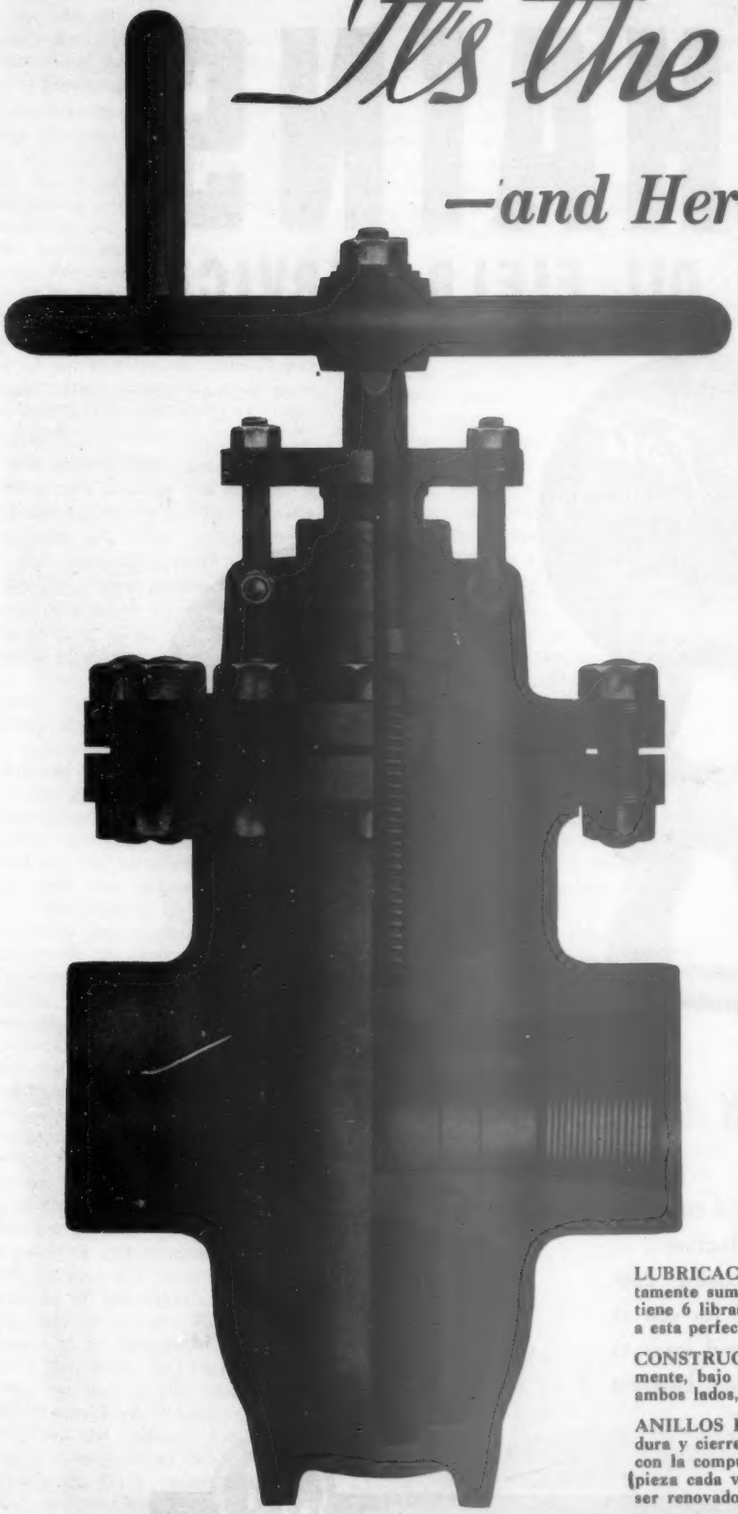
By discriminating selection of alloy steels, balanced construction without excess weight, and precision manufacture . . . Jeffrey can offer you better values in Oil Well chains. Built to A. P. I. standards, these chains are broken in for you at the factory and suffer less subsequent stretch and wear as the result. Since 1877 we have accumulated chain building experience by doing . . . will pass it on to you.

THE JEFFREY MANUFACTURING COMPANY

985-99 NORTH FOURTH STREET, COLUMBUS, OHIO

It's the WORLD'S CHOICE of GATE VALVES

—and Here are the Reasons Why:



UNIQUE DESIGN—This revolutionary gate valve gave the industry the greatest valve improvements ever known. Design incorporates improvements and refinements previously lacking in conventional type gate valves. The outstanding valve trouble is overcome by preventing the collection of sediment, scale, etc., so common to ordinary valves.

LESS AREA EXPOSED—A smaller area is exposed to pressure, confining the flow to minimum space. Caliper measurements show the actual maximum area exposed to pressure in a W-K-M 3" valve to be only 59¼ square inches, compared to 228½ square inches in a conventional 3" gate valve. Other sizes are in proportional contrast.

FULL OPENING—NO EXPOSED SEAT RINGS—Through-Conduit opening results in no restriction of flow, and Seat faces are not exposed to pressure or abrasion while in service. Should any sediment be carried down with the gate it is automatically washed out when the valve is opened.

POSITIVE LUBRICATION—Body serves as a grease chamber, in which all moving parts are entirely submerged in grease (W-K-M 3" Valve holds 6 lbs. of grease, providing ample lubrication for a long period). Extraordinary ease of opening and closing is assured by such perfection in valve lubrication.

DOUBLE WEDGE CONSTRUCTION—Parallel gates expand uniformly under all conditions, and double wedge construction assures positive seal-off on both sides in either open or closed position.

PATENTED WIPE AND SEAL RINGS—Patented bronze combination wipe-and-seal rings, in constant contact with the gate, keep gate and seats free from deposits, cleaning at each operation of the valve. Bronze seats, extra large, are quickly renewable.

Es la ELECCION MUNDIAL EN VALVULAS DE COMPUERTA

—a causa de las razones siguientes:

TIPO EXCLUSIVO—Esta revolucionaria válvula de compuerta dió a la industria el mayor perfeccionamiento en el ramo de válvulas que ella haya visto. En su construcción comprende perfeccionamientos y refinamientos de que antes carecían las válvulas de compuerta de tipo ordinario. La principal irregularidad de la válvula se salva en ella evitando la acumulación de sedimento, incrustación, etc., defecto común a las válvulas de tipos ordinarios.

MENOS SUPERFICIE EXPUESTA—Una menor superficie queda expuesta a la presión, confinando la corriente a un espacio mínimo. Medidas tomadas con un compás calibrador muestran que la superficie máxima actualmente expuesta la presión, en una válvula W-K-M de 3", es sólo de 59¼ pulgadas cuadradas, en comparación con las 228½ pulgadas cuadradas de la válvula de compuerta de 3" de tipo ordinario. Otros tamaños guardan la misma relación, en comparaciones similares.

ABERTURA COMPLETA—NINGUN ANILLO DE ASIENTO EXPUESTO—La abertura de paso recto resulta en la ausencia de restricción a la corriente y las caras de los asientos no quedan expuestas a la presión o al roce durante el trabajo. Todo sedimento bajado al fondo es automaticamente expelido al abrirse la válvula.

LUBRICACION POSITIVA—El cuerpo sirve de cámara de engrase, y en ella están completamente sumergidas en grasa todas las piezas de movimiento. (La válvula W-K-M de 3" contiene 6 libras de grasa y provee amplia lubricación durante largo período de tiempo.) Gracias a esta perfecta lubricación de la válvula, la abertura y el cierre se efectúan con suma facilidad.

CONSTRUCCION DE DOBLE CUNA—Las compuertas paralelas se extienden uniformemente, bajo todas las condiciones, y la construcción de cuña doble asegura cierre positivo en ambos lados, tanto en la posición abierta, como en la cerrada.

ANILLOS DE RESTREGADURA Y CIERRE PATENTADOS—Los anillos de restregadura y cierre, de combinación, patentados, hechos de bronce especial, tienen constante contacto con la compuerta y mantienen a la compuerta y los asientos libre de depósitos, dándoles limpieza cada vez que se mueve la válvula. Los asientos de bronce son extra grandes y pueden ser renovados con facilidad.

W-K-M Valve Catalog sent upon request.

A solicitud enviaremos catálogo de las válvulas W-K-M.

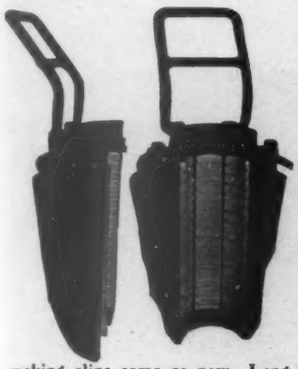
W-K-M Company, Inc.

OIL FIELD, PIPE-LINE & INDUSTRIAL EQUIPMENT

HOUSTON, Texas, U. S. A.

Export Office: 74 Trinity Place, New York

Cable Address: "WILKOMAC"



W-K-M ROTARY SLIPS

—The W-K-M Type 35 Friction Slips represents the latest advancement in rotary slips, with an improved design, thoroughly field tested on the longest pipe strings. Allows more gripping area, greater holding capacity, and a soft action. Takes hold or releases instantly, and will not slip, cut or bottle-neck your pipe. Extreme light weight permits ease of handling. Should wear occur on segments, they're readily replaced on the derrick floor, or redressed, at a nominal cost, making slips same as new. Long life assured by highest quality one-piece, drop-forged and heat-treated segments.

MANGUITOS GIRATORIOS W-K-M—El manguito o sujetador de tubería de perforación por sistema rotativo, de tipo de fricción W-K-M, representa el más reciente progreso en el ramo, cuya seguridad y utilidad ha sido demostrada practicamente en las tuberías más largas. Ofrece mayor superficie de sujeción, mayor capacidad de retención y acción más suave. Sujeta o suelta instantaneamente, sin resbalarse y sin cortar o deformar la tubería. Su peso extremadamente liviano facilita mucho su manejo. Cuando se desgastan sus segmentos, éstos pueden reparse con facilidad en el piso de la torre, o renovarse a poco gasto, quedan el sujetador lo mismo que nuevo. Su prolongada duración está asegurada por sus segmentos de una pieza, de acero forjado a martinete y cementado.

HAUSER ROUND KELLY DRIVE

—W-K-M's Hauser Round Kelly Drive enables you to drill in under pressure or in small diameter casing, using a joint of drill pipe or tubing as a Kelly, entirely eliminating the Kelly in drilling-in operation. Flexible, self-adjusting roller racks allow for misalignment, and provide a positive drive for rotation; yet are entirely "free-wheeling" in upward or downward direction. Blowout preventer rams may be closed without having to clear rams with the Kelly. Each full length may be run without shutdown. With this Drive, you now drill in under pressure with oil, doing away with necessity of washing well. Available for 2", 2½", 3", and 4" tubing or drill pipe.

JUNTA KELLY HOUSER CIRCULAR PARA PERFORACION—La junta kelly Houser circular para perforación permite perforar en tubería bajo presión o de diámetro pequeño, empleando una unión de tubo de perforación o una tubería, como kelly, suprimiendo el mismo kelly corriente en el trabajo de perforación. Es una herramienta muy adaptable, de ajuste automático, para evitar la desalineación y provee una propulsión positiva para la rotación, estando completamente independiente de movimiento libre hacia arriba o hacia abajo. Los aparatos para evitar las explosiones pueden cerrarse sin pertubar el peso de la junta kelly. Cada tubería completa puede bajarse sin necesidad de parar el trabajo. Con la presente herramienta se puede perforar bajo presión, con petróleo, evitándose la necesidad de lavar el pozo. Se ofrece para tubería o tubo de perforación de 2", 2½", 3" y 4".

W-K-M ROD HANGER—

A safety product; saves 20 to 30% rod pulling time over obsolete method of laying rods down. Eliminates use of oil soaked rod walks. Protects rods against breakage, kinking, sand and grit. Makes rod handling easier, simpler, cleaner and safer for roustabout crew. The only flexible means of safely suspending your rods.

ABRAZADERA DE SUSPENSION DE VASTAGO W-K-M—Un producto de seguridad; ahorra de 20 a 30% del tiempo de los vástagos, en comparación con los métodos anticuados de tender los vástagos. Evita la molestia de lugares mojados con petróleo. Protege los vástagos contra rotura, torcedora, arena, etc. Imparte al manejo de vástagos facilidad, limpieza y seguridad, para la cuadrilla de operarios. Es el único medio seguro de suspender los vástagos.

Deepwell Type

Regular Type

Series 15,000

W-K-M TUBING SLIPS

—The original flexible, one-man tubing slip is furnished in all sizes to 4½" inclusive. Slips are forged steel throughout; and spider is top-grade steel casting. Segments may be redressed any number of times. Made in Regular type for depths to 3,000 feet, Deepwell type for depths to 6,000 feet, and the newest and latest Series 15,000 for 15,000 feet or more.

MANGUITOS O CUNAS W-K-M PARA TUBERIA—El manguito flexible original, para tubería, de manejo por un hombre solo, se suministra en todos los tamaños, hasta el de 4½" inclusive. Son todos forjados de acero; la araña o cruceta es de acero fundido de superior calidad. Los segmentos pueden repararse varias veces. Se hacen en tipos corrientes para profundidades de 3000 piés. También se ofrecen en tipo para pozo profundo, hasta de 6000 pies, y tenemos, además, la nueva serie 15.000 para pozos de 15.000 o más piés de profundidad.

W-K-M PIPE CLEANING MACHINES

(Traveling or Stationary)

Cleans both old and new lines. It travels along the made-up line at variable speeds under its own power, cleaning two or more miles daily. It has a double cleaning head containing hundreds of toothed cutter wheels, which produce a chipping action, removing all scale, rust, dirt, etc. A series of steel wire brushes then brush pipe to a clean, bright surface. Special scraper knives remove felt or wrapping. The machine is readily convertible from one size to another by simple adjustments, or from traveling to stationary cleaning machine. Built in a range of sizes to clean 2" to 24" pipe.

MAQUINA W-K-M PARA LIMPIAR TUBERIA
(Tipo móvil o fijo)

Limpia tuberías nuevas y viejas. Viaja a lo largo de la línea de tubería preparada, a varias velocidades, bajo fuerza propia, limpiando dos o tres millas al día. Tiene doble cabeza limpiadora, que contiene centenares de ruedas dentadas, que producen una acción cortante, que quita toda la incrustación, moho, tierra, etc. Una serie de cepillos de alambre limpia la tubería, dejándola con una superifie brillante. Hay cuchillas especiales para cortar y quitar el fieltro u otro material de envoltura. La máquina se adapta facilmente a cualquier tamaño de tubería, y también se puede convertir rapidamente de máquina móvil a máquina fija. Se hace en tamaños para limpiar tubería de 2" a 24".

Descriptive literature on any of these products sent upon request

Información detallada sobre cualquiera de estos productos, a solicitud.

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- Wire Line Core Barrel
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W-K-M Company, Inc.

OIL FIELD, PIPE-LINE & INDUSTRIAL EQUIPMENT

HOUSTON, Texas, U. S. A.

Export Office: 74 Trinity Place, New York

Cable Address: "WILKOMAC"

View of Gulf Refining Co.'s refinery at Port Arthur, Tex., showing refinery, canal, tankers, and storage tanks

Vista de la refinería de la Gulf Oil Co. en Port Arthur, Texas, que muestra la refinería, el canal, los transportes y los tanques o depósitos de almacenaje

Trends in Refining Practice

Tendencias en La Refinacion

PETROLEUM REFINING

THERE is no evidence of any slackening in the furious pace of development, new inventions, or improvements in petroleum-refining technique. The obsolescence factor mounts ever higher. Whole new processes are moved from the laboratory to the plant and a new product is born having properties hitherto felt to be impossible to obtain, and opening new fields of application.

This new process has meant the cooperation of refiners, engineering, and construction firms, parts suppliers, metallurgists, and other allied interests. Factors are so diverse and the ramifications so many that the final unit is possible only through the collaboration of many people.

Improvements or new developments are by no means confined to new processes. No piece of equipment is too insignificent to escape attention from the manufacturer or user in the search for better tools. Great credit is due both the user and the supplier, as they contribute equally to the great forward movement.

The time was when stillmen made their cuts solely by gravity. Yesterday, great fractionating towers made several cuts simultaneously to relatively narrow boiling ranges and with little overlapping. Today, they pick out single hydrocarbon groups from the many and, by means almost magical, convert them into spectacular products of superquality.

The constant search for improvement is forced partly by the competitive urge to make better products, by the economic desire to make them cheaper, and by the demand from consumers for new and better products to satisfy new machinery. More power, more speed, and higher pressures is the cry from the mechanical world, and the refiner is called upon to fuel and lubricate these devices. This pressure is tremendous and is largely responsible for the millions of dollars spent annually by the refining industry on new or improved equipment.

In analyzing the problem of making a capital expenditure for new equipment, the refiner usually considers the project from three angles: First, the production of higher quality materials required either from a competitive condition or from new usage; second, production of a greater per cent of higher-priced products; third, reduced production costs. It is essential that high-quality fuels and lubricants be produced to keep the user satisfied and to keep up with the

(Continued on Page 266)

REFINACION DEL PETROLEO

NO hay evidencia de ningún retardo en el rápido progreso de los desarrollos, nuevos inventos y mejoramientos en general en la técnica de la refinación del petróleo. Los métodos de ayer se presentan hoy anticuados. Completos procedimientos nuevos pasan del laboratorio a la refinería y nacen nuevos productos cuyas propiedades insospechadas vienen a establecer nuevos campos de aplicación.

Todo este enorme desarrollo se basa sobre la cooperación de los refinadores, firmeas de ingeniería y construcción, fabricantes de equipos y piezas, metalurgos y otros intereses afines. Tan diversos son los factores y tantas las ramificaciones, que la unidad final es posible sólo mediante la colaboración de mucha gente.

Las innovaciones o nuevos desarrollos no se confinan unicamente a procedimientos nuevos. Ningún equipo es demasiado insignificante para eludir la atención del fabricante o del consumidor en busca de mejores herramientas. Merecen igual crédito el comprador y el vendedor o fabricante, pues ambos contribuyen, en igual medida, al gran movimiento progresivo.

Hubo un tiempo en que los refinadores se atenían exclusivamente a la gravedad para la destilación de sus productos. Vinieron después las grandes torres fraccionadoras a destilar simultaneamente varios productos, dentro de limitadas escalas de temperaturas y con muy poca superposición de destilación. Hoy en día, se separan determinados grupos de hidrocarburos, de los muchos que hay, y por medios casi mágicos, se convierten en productos espectaculares de calidad superexcelente.

La busca constante de progresos e innovaciones se debe, en gran medida, a la competencia en productos mejores, al deseo de hacerlos de una manera más económia y a la demanda, por parte de los consumidores, de productos nuevos y mejores para satisfacer los requisitos de nueva maquinaria. Más fuerza, más velocidad y mayores presiones, es la exigencia contínua del mundo de la mecánica, y el refinador queda así obligado a suministrar los combustibles y lubricantes que exigen los nuevos equipos o maquinaria. La exigencia de esta demanda es enorme y en gran parte es responsable por los millones de dólares que anualmente se gastan en la industria de la refinería, en equipos nuevos o perfeccionados.

(Continue en Pagina 266)

MENE GRANDE—16-inch oil line, 100 miles long, built by Mene Grande Oil Co. from Oficina to Guanta in Venezuela. Total of 12,192 joints arc welded in 90 working days with Lincoln Welders and "Fleetweld" Electrodes.

FUERTE—That's the local description of an arc weld. They know that it is STRONGER than the pipe itself. This bull plug is being fabricated on the Barco line in Colombia.

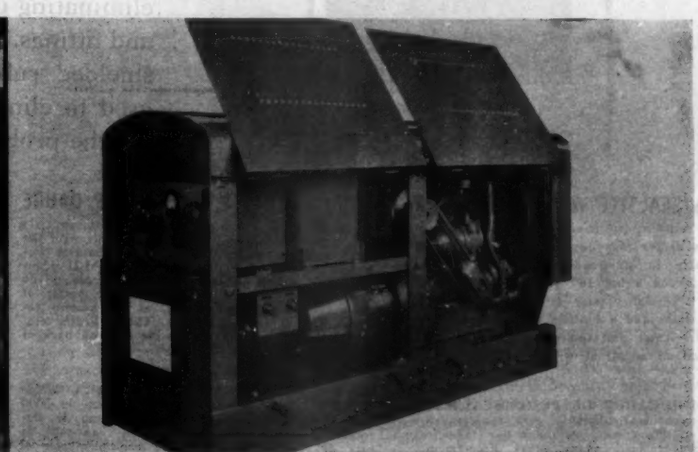
South of the Border—

EL ARCO ELECTRICO

cuts costs and improves construction

BARCO—270-mile arc welded line of 10-inch and 12-inch pipe built by South American Gulf Oil Company, Barco Concession from Petrolea to Covenas in Colombia by stove pipe method. Note the rugged country. Lincoln welders are shown on the job.

NUEVO—The NEW Diesel *"Shield-Arc"* Welder. Saves up to 40c per hour in fuel cost. Equipped with compact engine type starter, simplifying construction and avoiding battery care and expense.



For further details, consult the nearest Lincoln office or mail the coupon

LINCOLN *SHIELD-ARC* **WELDING**

PRODUCES A STRONGER, MORE LASTING CONSTRUCTION FASTER, AT LESS COST

THE LINCOLN ELECTRIC CO.,
Dept. N-657, Cleveland, Ohio

☐ Send details on (state application)_____

☐ Send free bulletin on New *"Shield-Arc"* Welders.

*Name*_____

Company_____

Position_____

Address_____

City_____ State_____

MAKE THESE TWO PAGES YOUR GUIDE TO *better drilling control!*

★ On these pages you'll find a partial line-up of Martin-Decker oil field instruments—many, like the Quintuplex, familiar to operators in every oil producing country in the world. Look them over. For performance, dependability and accuracy right down to the very last foot—*no matter where you drill*—Martin-Decker instruments meet your most exacting needs!

THE "SEALTITE" DRILLING CONTROL INSTRUMENT

The Martin-Decker "Sealtite" Drilling Control has many outstanding improvements, both in method of installation and in construction of gauges and recorders. The instrument complete consists of a "Sealtite" Weight Indicator, "Sealtite" Mud Pump Gauge, Torque Gauge and Tachometer, all unitized into one rugged unit. The triplex Recorder is mounted back of the indicating gauge, eliminating use of copper valves and fittings. High pressure steel shielded rubber hose has been used to eliminate, once and for all, the problem of fluid leaks.

El gobierno o control de perforación Martin-Decker "Sealtite" ofrece varias ventajas sobresalientes, tanto en método de instalación, como en construcción de manómetros y registros. El instrumento completo consta de un indicador de peso "Sealtite", un manómetro de bomba de lodo "Sealtite", un indicador de esfuerzo de rotación y un contador de velocidad, todos en un solo grupo. El indicador triple está instalado detrás del manómetro de indicación, suprimiendo así el uso de válvulas y conexiones de cobre. Se ha empleado manguera de caucho con revestimiento de acero de alta presión, para suprimir, para siempre, el problema del escape de líquido.

The "SEALTITE" WEIGHT INDICATOR

with capacity sufficient to handle loads on wells *deeper than any drilled to date*, reads directly in thousands of pounds (or in points) on a big 16" illuminated dial. It has a special vernier gauge for lightweight operations and a built-in recording element. Both vernier and indicating gauges can be turned on or off at will.

EL INDICADOR DE PESO "SEALTITE" con capacidad suficiente para manejar cargas en pozos *más profundos que todos los perforados hasta ahora*, acusa directamente, en millares de libras (o en puntos) en un cuadrante grande de 16" muy bien iluminado. Tiene un calibrador vernier especial, para trabajos de peso liviano y un elemento registrador, que forma parte integrante. Tanto el vernier como los manómetros de indicación pueden abrirse y cerrarse a voluntad.

THE "SEALTITE" MUD PUMP GAUGE

available in 3000 or 5000 pound capacity, consists of a bronze high-pressure diaphragm unit with the entire gauge case oil filled and the mechanism protected by special pulsation dampers. A M-D flexoglass lens, shock and pressure proof, replaces the ordinary gauge glass. Installation is a matter of making one union connection, as the system remains hooked up at all times. The recording element is a part of the master recorder on back of the steel case.

EL MANOMETRO "SEALTITE" PARA BOMBA DE LODO ofrecido en capacidades de 3000 o 5000 libras, consiste en un mecanismo de diafragma de bronce, de alta presión, con toda la caja del instrumento llena de aceite, y con el mecanismo protegido por amortiguadores especiales de pulsación. Un cristal M-D Flexoglass, a prueba de choque y presión, se usa en lugar del vidro ordinario. La instalación se reduce a hacer una conexión en la unión, pues el sistema queda coordinado durante todo el tiempo. El elementro registrador forma parte del registrador principal que hay detrás de la caja de acero.

THE TORQUE GAUGE

is connected to the engine manifold by copper tubing and fittings. The 350 lb. capacity gauge is oil filled and equipped with pulsation dampers to smooth out variations in torque reading. A M-D flexo-glass lens replaces ordinary glass, and the recording element is fitted into the triplex Recorder.

EL INDICADOR DE ESFUERZO DE ROTACION se conecta al múltiple del motor por medio de tubería y conexiones de cobre. El indicador de 350 libras de capacidad está lleno de aceite y provisto de amortiguadores de pulsación, para evitar variaciones en las acusaciones de esfuerzo de rotación. Un cristal M-D Flexoglass se usa en lugar del vidrio ordinario y el elemento registrador se incluye en el indicador triple.

THE ROTARY TABLE TACHOMETER

is fully adjustable for any ratio of table drive and is furnished with either permanent take-off for individually driven tables or removable for drawworks driven tables. Capacity is 300, 500 or 600 RPM. Easy calibration is provided by an adjustment stem passing through the M-D flexo-glass lens.

EL INDICADOR DE VELOCIDAD DE PLATAFORMA DE ROTATIVA es completamente ajustable a cualquier régimen de velocidad de propulsión de plataforma, y se suministra con tomafuerza permanente, para plataformas accionadas individualmente, o en tipo quitable para plataformas accionadas por aparejo de maniobras. Capacidad para 300, 500 o 600 rpm. La calibración se facilita mediante un vástago de ajuste que pasa por al cristal Flexoglass M-D.

Complete detailed information concerning the Martin-Decker "Sealtite" Drilling Control Instrument will gladly be supplied on request.

BESIDES THE PRODUCTS ILLUSTRATED AND DESCRIBED ON THESE PAGES, MARTIN-DECKER MANUFACTURES THE FOLLOWING OIL FIELD INSTRUMENTS

Measuring Line Weight Indicator
Cement Pump Gauge
Individual Mud Pump Gauge
1000 lb. Unitized Mud Pump Gauge
Radium Temperature Recorder
Pump Dynamometer
Pull Rod Dynamometer
Rapid Pressure Booster
Pulsation Damper

MARTIN

LONG

SAN JOAQUIN VALLEY: A. F. McQUISTON

THE QUINTUPLEX DRILLING CONTROL INSTRUMENT

Known and used the world over, the Quintuplex covers every phase of drilling operations accurately and scientifically. It concentrates right before the driller important information such as weight on bit, load on derrick, slush pump pressure, table speed, and drill pipe torque. It continuously records on a single chart the slightest variation in weight, pressure and torque, providing accurate data to guide present as well as future drilling programs. You'll find this famous instrument used on wells in every oil producing country of the world.

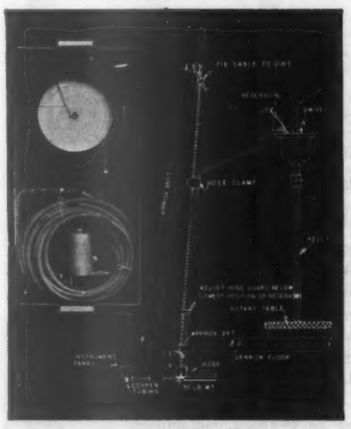
Conocido y usado en todo el mundo, el Quintuplex cubre todas las fases de los trabajos de perforación, de una manera cientificamente exacta. Presenta a la vista del perforador importante información como la siguiente: el peso sobre la barrena, la carga sobre la torre de perforación, la presión de la bomba de lodo, velocidad de la plataforma de la rotativa y esfuerzo de rotación del tubo de perforación. Registra continuamente, en un sola tabla o gráfico, las más leves variaciones de peso, presión o esfuerzo de rotación, suministrando datos exactos para servir de guía a los presentes y futuros programas de perforación. Este famoso instrumento se usa en los pozos de todo país productor de petróleo del mundo.

THE CLIPPER PORTABLE WEIGHT INDICATOR

And a real time-saver for all short jobs is the Clipper—an indicator that combines accuracy, sensitivity, and ruggedness with featherweight portability. It accommodates all lines from ¾" to 1¼" diameter, and the ten easy-to-read dials nested inside the case are ready for any commonly-used string-up. Light weight construction eliminates swinging on the deadline, and complete factory assembling and sealing provides a tamper-proof and weather-proof instrument that requires no attention while in use.

El Clipper es un verdadero ahorrador de tiempo para todos los trabajos cortos. Es un indicador que combina exactitud, sensitividad y firmeza, con peso liviano que facilita su portabilidad. Sirve para todo tamaño de cable de ¾" a 1¼" de diámetro, y los diez cuadrantes de fácil lectura van muy bien dispuestos dentro de la caja, listos para cualquier combinación corriente. La construcción liviana evita la oscilación en el cable y el completo montaje y cierre en la fábrica garantiza un instrumento seguro y resistente al tiempo, que no requiere ninguna atención en el trabajo.

AUTOMATIC RATE OF PENETRATION RECORDER



An automatic time-drilling-logging instrument for continuously and accurately recording rate at which the bit penetrates the formation. The Rate of Penetration Recorder is easy to install, simple to use, and requires attention only once a day. Yet it provides a permanent 24-hour record of the rate of bit penetration while drilling and automatically records the formation breaks as they occur. When plotted on a graph, this information is extremely valuable for correlation purposes, for studying equipment performances, and for use as a supplement to the electrical log of the well. This data is particularly helpful in wildcat locations.

Un instrumento automático, para llevar cuenta del tiempo de perforación, que registra continua y exactamente la velocidad a que penetra la barrena o sonda en la formación. El indicador de velocidad de penetración se instala y se usa con suma facilidad y sólo requiere atención una vez al día. Suministra un registro permanente de 24 horas de la velocidad de la penetración de la barrena, durante la perforación, anotando automáticamente las interrupciones de la formación a medida que se presentan. Cuando se anota en un gráfico, esta información es muy valiosa para los fines de correlación, para estudiar el funcionamiento del equipo, y para suplementar el informe diario eléctrico de perforación del pozo. Esta información es de suma importancia en campos poco explorados.

SPECIAL ILLUMINATED WEIGHT INDICATOR

The Martin-Decker Special is a revolutionary weight indicator for all portable installations. It combines maximum accuracy, sensitivity and capacity with increased visibility. It's instantly ready for any job on the lease. The Special has vernier accuracy for lightweight drilling, yet capacity sufficient to control wells deeper than any thus far drilled. Ten interchangeable dials are instantly ready for all conventional string-ups and line sizes, and if you want to read weight in points, there's also a "points" dial always visible. The numerals cover 360° of dial circumference, *and built-in illumination affords 24-hour visibility.*

El Martin-Decker Special es un indicador de peso de caracter revolucionario, para toda instalación portátil. Combina exactitud máxima, sensitividad extraordinaria y gran capacidad, con mejor visibilidad. Está inmediatamente listo para cualquier trabajo en la propiedad. El Special tiene exactitud de vernier para la perforación liviana y al mismo tiempo tiene una capacidad suficiente para gobernar pozos más profundos que todos los perforados hasta ahora. A su inmediata disposición tiene diez cuadrantes intercambiables para todas las combinaciones corrientes y tamaños de cables, y cuando se quiera leer el peso en "puntos", hay siempre visible un cuadrante calibrado en puntos. Los números cubren los 360 grados de la circunferencia del cuadrante y una *iluminación integrante asegura visibilidad de 24 horas.*

UNITIZED MUD PUMP GAUGE

The Unitized is the most rugged instrument ever built for measuring slush pump pressures, and it's the instrument you need for all quick jobs. It is unaffected by constantly surging pressures, and is engineered throughout to withstand pump vibrations. The gauge case is oil filled and a M-D flexo-glass lens replaces the ordinary glass formerly used. The Unitized contains Diaphragm Unit, Pulsation Damper and Indicating Gauge in one compact case. It is sensitive, accurate, dependable on all jobs—big or little—and requires no pumping or refilling while in use.

Este modelo "Unitized" es el instrumento más firme que se ha construído hasta ahora, para medir las presiones de la bomba de lodo, y es el instrumento que se necesita para todos los trabajos rápidos. Es inafecado por las violentas variaciones de presión y está proyectado para resistir muy bien las vibraciones de la bomba. La caja del manómetro está llena de aceite y un cristal Flexoglass M-D se usa en lugar del vidrio corriente que se empleaba antes. El modelo Unitixed contiene mecanismo de diafragma, amortiguador de pulsación y manómetro de indicación, todo en una caja compacta. Es sensitivo, exacto y seguro en todos los trabajos grandes o pequeños. No requiere rellenadura durante el trabajo.

THE SLIM-HOLE WEIGHT INDICATOR

The Martin-Decker Slim-Hole Weight Indicator is a valuable instrument for use in all types of shallow hole drilling and core testing operations. Light, compact, portable, it accurately indicates loads up to 150,000 pounds and has six interchangeable dials for all conventional string-ups and line sizes. The diaphragm unit is an integral part of the all-bronze gauge case, and a built-in pulsation damper smoothes out readings even in the roughest drilling. A newly-designed "C" clamp, which requires no shims for adjustment to different sized lines, operates in back of the case, allowing use of the full dial circumference for the numerals. Tested, calibrated and sealed at the factory, the Slim-Hole is built to give years of accurate, dependable and economical service.

El indicador de peso Martin-Decker "Slim-Hole" de agujero angosto, es un instrumento valioso para uso en todo tipo de perforación de corta distancia y trabajo de sacar núcleos o muestras. Liviano, compacto y portátil, indica exactamente las cargas hasta 150.000 libras. Tiene seis cuadrantes intercambiables para toda combinación corriente y cualquier tamaño ordinario de cable. El diafragma forma parte integrante de la caja de bronce del manómetro y un amortiguador, también integrante, absorbe las pulsaciones para facilitar la lectura, aun durante le perforación más recia. Una nueva grapa en "C" recientemente perfeccionada, que no requiere laminitas o cuñas para su ajuste o adaptación a diferentes tamaños de cable, funciona detrás de la caja, permitiendo el uso de toda la circunferencia del cuadrante, para los numerales. Ensayado, calibrado y cerrado en la fábrica, el indicador de peso "Slim-Hole" está construído para dar muchos años de servicio exacto, seguro y económico.

Write Martin-Decker Corporation for full details on the complete line of Martin-Decker Products, or contact your nearest Martin-Decker representative.

DECKER CORP.

ON EACH, CALIFORNIA

JISTON KERSFIELD, CALIF. ★ MID-CONTINENT: REED ROLLER BIT CO., HOUSTON, TEXAS

HOME OF THE WEIGHT INDICATOR

LANE-WELLS GUN PERFORATOR GIVES YOU SAFETY, ACCURACY AND GREATER PENETRATION

Special Service Truck Gun Perforator
Perforador de pistola en camión especial de servicio

The Lane-Wells Gun Perforator Field units, used successfully on approximately 25,000 oil wells in the United States during the past seven years is now for sale and available to operators in fields outside of the United States, Canada, and Trinidad. This equipment gives accurate, positive penetration of casing at predetermined levels without danger of cracking cement or splitting casing. Four different units are available and selection depends on the amount of gun perforating to be done.

Lane-Wells Special Service Truck **(illustrated above).**

For use where Gun Perforating operations are performed regularly and on a large scale over a long period of time. Equipped with 8000'-15,000' of special cable, mechanical controls, weight indicating and depth measuring devices, gun tubes, electrical control system including generator, rectifier, variac, control panel, communication microphones, cable reels, cables, etc.

Lane-Wells Skid Hoist Gun Perforator Unit.

A light weight Gun Perforator unit, ideal for mounting on the flat bed of any make of truck, either temporarily or permanently for perforating operations. Complete in every mechanical and electrical detail.

Lane-Wells Electrical System Central Control Unit.

Central control unit for gun firing, weight-indicating and depth measuring devices, communication between panel and rig or hoist, etc., with safety appliance.

Lane-Wells Portable Gun Perforator Control Panel.

This portable firing control panel is powered by "B" batteries for firing Lane-Wells Gun Perforator or setting Lane-Wells Bridging Plugs.

Send for complete catalog of Lane-Wells Gun Perforator units with specifications and prices.

● ●

EL PERFORADOR DE PISTOLA LANE-WELLS DE SEGURIDAD, EXACTITUD Y MAYOR PENETRACION

Los perforados de pistola Lane-Wells, para campos petrolíferos, usados con éxito en cerca de 25.000 pozos de petróleo en los Estados Unidos de América, durante estos últimos siete años, se ofrecen ahora la exportación y están, por lo tanto, al alcance de las empresas interesadas, en todo país afuera de los Estados Unidos de América, Canadá y Trinidad. El equipo de perforador de pistola da exacta y positiva penetración de tubería, a niveles predeterminados, sin el peligro de romper el cemento o de partir la tubería. Se ofrecen cuatro grupos diferentes y su selección depende de la cantidad de perforación con pistola que ha de hacerse.

Camión especial de servicio Lane-Wells (ilustrado arriba).

Para uso donde los trabajos de perforación con pistola se hacen corrientemente, en grande escala y por largo período de tiempo. Equipado con 8000 a 15000 piés de cable especial, gobiernos mecánicos, instrumentos de indicación de peso y profundidad, tubos de pistola, sistema de gobierno eléctrico, que comprende generador, rectificador, cuadro de distribución, micrófonos de comunicación, carretes de cable, cables, etc.

Grupo de pistola de perforación Lane-Wells y montacarga en patines.

Un grupo de pistola de perforación de peso liviano, ideal para montaje en la plataforma plana de camión de cualquiera marca, para instalación provisional o permanente, para trabajo general de perforación. Completo en todo detalle mecánico y eléctrico.

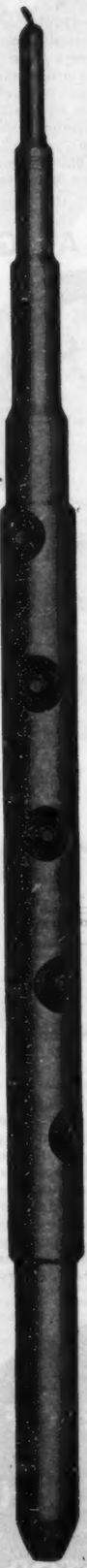
Grupo Lane-Wells de gobierno central de sistema eléctrico.

Grupo de gobierno central de sistema eléctrico, para la perforación con pistola, que comprende indicadores de peso y de profundidad, comunicación entre el cuadro de distribución y la torre o montacarga, etc. incluyendo dispositivos de seguridad.

Cuadro de distribución o gobierno de pistola de perforación Lane-Wells, tipo portátil.

Este cuadro de gobierno de pistola de perforación está provisto de baterías "B" para accionar la pistola de perforación Lane-Wells o para fijar los tapones conectores Lane-Wells.

Pídanos ejemplar del completo catálogo de perforadores de pistola Lane-Wells en que damos detalles de su construcción y precios.



5¼" O.D. Gun Perforator

Perforador de pistola de 5¼" de diámetro exterior

LANE-WELLS PACKERS AND LINER HANGERS MEET EVERY CONDITION ENCOUNTERED IN DRILLING AND PRODUCING WELLS

Lane-Wells builds a complete line of Packers and Liner Hangers to meet successfully every condition requiring the use of these specialized tools. Packers are offered in three basic types, (1) Hook Wall, (2) Bottom Hole, (3) Anchor Formation Type. The packing assembly consists of multiple rings, each built up of layers of graphite-impregnated, bias-cut canvas moulded around a rubber or neoprene core which are alternated with metal expansion rings.

Lane-Wells Packers offer the operator the following outstanding advantages: (1) Five-fold safety pack-off. (2) No vulcanizing to the casing. (3) Perfect pack-off against pressure. (4) Packer body shielded from collapsing strain. (5) No overexpansion of packing rings. (6) Packing rings protected while running in. (7) Maximum by-pass area. (8) Rubber or neoprene packing rings. (9) Can be released and reset without pulling tubing from well.

Lane-Wells Liner Hangers employ the same basic principles of Lane-Wells Packers. The assurance of easy removal and 100% salvage value means greater economy. Lane-Wells liner setting tool employs a threaded joint as a safe releasing connection for liner hangers and liner adapters.

Send for complete catalog of Lane-Wells Packers and Liner Hangers with specifications and prices.

● ●

LOS OBTURADORES O TAPONES Y LOS SUJETADORES COLGANTES DE TUBERIA LANE-WELLS SATISFACEN TODO REQUISITO QUE SE PRESENTA EN LA PERFORACION Y PRODUCCION DE POZOS

La Lane-Wells fabrica un surtido completo de obturadores o tapones y sujetadores colgantes de tubería, que satisfacen con éxito, toda condición que exige el uso de estas herramientas especiales. Los obturadores o tapones se ofrecen en tres tipos básicos: (1) de gancho mural, (2) de agujero de fondo, (3) de anclaje en la formación. El grupo de empaquetadura consiste en anillos múltiples, cada uno formado por capas de lona cortadas al sesgo, impregnadas de grafito y moldeadas alrededor de un núcleo de caucho o neopreno, que se alternan con anillos metálicos de extensión.

Los obturadores o tapones Lane-Wells ofrecen las siguientes ventajas sobresalientes: (1) Empaquetadura de seguridad de cinco capas. (2) No hay vulcanización a la tubería. (3) Perfecta obturación contra la presión. (4) Cuerpo del tapón protegido contra deformación a causa de la tensión. (5) No hay anillos con extensión exagerada o indebida. (6) Anillos protegidos durante el movimiento. (7) Máximo espacio de paso en derivación. (8) Anillos de caucho o de neopreno. (9) Puede soltarse y fijarse de nuevo sin sacar el tubo afuera del pozo.

Los sujetadores colgantes de tubería, Lane-Wells emplean los mismo principios fundamentales que los tapones u obturadores Lane-Wells. La seguridad de fácil remoción y 100% de valor de recuperación, significan mayor economía. La herramienta Lane-Wells, para colocar tubería, emplea una unión roscada, como una conexión segura de soltura, en conexión con los sujetadores colgantes y adaptadores de tubería.

Pídanos ejemplar del completo catálogo de obturadores o tapones y sujetadores colgantes de tubería Lane-Wells, que contiene información detallada y precios.

Production Type Packer
Obturador o tapón de tipo de producción

Circulation Type B Packer
Obturador de circulación, tipo B

Liner Hanger
Sujetador colgante de tubería

LANE-WELLS SURVEY INSTRUMENTS GIVE A COMPLETE RECORD OF DIRECTION AND INCLINATION OF DRILLING WELLS

Standard Single Shot

Modelo Standard de una sola operación

Small Single Shot

Modelo pequeño de una sola operación

Go-Devil

Modelo go-devil

These instruments run by the oil company crew are so constructed that they can be used without knowledge of complicated mathematics or photography. Record is available within five minutes after coming out of the hole.

Standard Photo-Record Single Shot Survey Instrument, 3¼" O.D. records direction and inclination in open hole. Run on sand line.

Small Photo-Record Single Shot Survey Instrument, 2¼" O.D. records direction and inclination in open hole. Run on piano wire or used with wire line coring equipment in which case the removal of drilling tools is not required.

Photo-Record Go-Devil, 1¾" O.D. gives inclination readings when dropped through drill pipe.

Send for free Bulletin describing Lane-Wells Survey Instruments and their use. Complete with specifications and prices.

LOS INSTRUMENTOS DE RECONOCIMIENTO LANE-WELLS DAN INFORME COMPLETO DE LA DIRECCION E INCLINACION DE LA PERFORACION DEL POZO

Estos instrumentos, manejados por los operarios de la compañía petrolera, están construidos de modo que pueden ser usados por cualquier persona sin conocimiento de complicadas matemáticas y fotografía. El informe se tiene cinco minutos después de sacado el instrumento del agujero.

Instrumento de reconocimiento de registro fotográfico de una sola operación, modelo Standard, de 3¼" de diámetro exterior, registra la dirección e inclinación del agujero abierto. Se corre en el cable para bomba de agua.

Pequeño instrumento de reconocimiento de registro fotográfico de una sola operación, de 2¼" de diámetro exterior, para registrar la dirección e inclinación del agujero abierto. Se corre en cable de alambre delgado o se usa con el cable de alambre del equipo para sacar núcleos, en cuyo caso no es necesario quitar las herramientas de perforación.

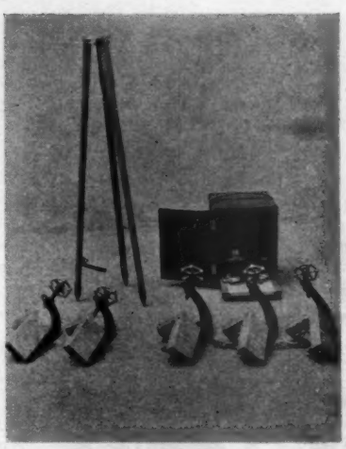
Raspatubo o go-devil de registro fotográfico, de 1¾" de diámetro exterior, registra la inclinación cuando se baja por la tubería de perforación.

Pídanos boletín descriptivo de los instrumentos de reconocimiento Lane-Wells y su uso. Completo con especificaciones y precios.

LANE-WELLS EQUIPMENT GIVES COMPLETE DIRECTION CONTROL OF DRILLING WELLS

Lane-Wells Knuckle Joint is a tool designed to enable operator to change the course of a well and direct it to a predetermined point below the ground. It is operated with normal rotation of the drill pipe and the usual mud circulation. The Knuckle Joint is oriented in the hole by means of Lane-Wells Orienting Equipment which makes possible a record of all rotation of the drill pipe on which the deflecting tool is lowered into the well. Orienting Equipment consists of telescope, transit, tripod, target, clamp screws and bodies.

Write for Bulletin on Lane-Wells Direction Control of Drilling Wells and Lane-Wells Orienting Equipment.



Orienting Equipment

Equipo de orientación

EL EQUIPO LANE-WELLS DA COMPLETO GOBIERNO DE LA DIRECCION DE LA PERFORACION DE POZOS

Knuckle Joint

Unión de charnela o articulada

La unión de charnela Lane-Wells es una herramienta que permite al operario cambiar la dirección de un pozo y dirigirlo a un punto predeterminado debajo de la tierra. Funciona con la rotación normal del tubo de perforación y con la corriente circulación de lodo. La unión de charnela se orienta en el agujero por medio del equipo de orientación Lane-Wells, el cual hace posible un registro de toda la rotación del tubo de perforación en que la herramienta de deflexión se baja por el pozo. El equipo de orientación comprende un telescopio, un tránsito, un trípode, una mira, tornillos de sujeción y cuerpos.

Pídanos boletín descriptivo del equipo Lane-Wells de gobierno de dirección y de orientación de la perforación de pozos.

TECHNICAL OILFIELD SERVICES

competition. The highest-yield value must be secured from a barrel of crude and the cost per unit of production kept low in order to survive economically.

The oil industry has ever been willing to put earnings back into additions and improvements, scrapping units not yet amortized to save a few cents in operating costs or to make an extra octane number or two. This policy is responsible for the remarkable strides made in the art of refining, and has made possible the manufacture of superior fuels and other petroleum products generally sold now.

However, the refining industry has reached the point of stable and highly competitive business. Margin between cost and selling price has steadily narrowed. Such a condition calls for more careful study of projects before approval is given. The decision to scrap an operating unit in favor of a new process is made only after long and careful consideration of all factors involved.

RESEARCH

The amount of research carried out in hydrocarbon utilization is tremendous and involves both short-term and long-term projects. Programs of length are usually directed toward the discovery of basic new data concerning products or processes. The data, when finally unearthed, may completely change some practice of the industry or bring a new one into being. Only a portion of projects undertaken requires years for carrying out; yet the long years of painstaking study, disappointments, and expense that have preceded some great discoveries bear testimony to the fact that research is a process demanding time and concentration.

The average refiner with a small research staff finds that long-time projects are difficult to carry out because of the interference given by the exigencies of operation. Furthermore, the expense is large, and it becomes more difficult to carry out fundamental research with a goal that cannot be evaluated. Hence, work of this type is generally carried out by the large laboratories. New processes put on the market in the past year or so furnish proof that these research organizations are extremely ingenious and capable.

When the various groups are considered, such as individual refinery units working on production problems, great laboratories busy with long-term projects, research foundations, universities, federal bureaus, process licensors, equipment purveyors, and individuals, it may be seen that the productive effort is immense. It has meant the production of fuels and lubricants to meet all demands, the development of products that permit new operations in other fields, and now promises of hydrocarbon utilization into channels far removed from petroleum in the accepted forms.

Twenty-five years ago the interruption in supply of various chemicals purchased in Europe caused distressing shortages in many industries. Processes have since been developed here to supply these needs. In 1914 petroleum was an insignificant source of chemicals, but today, due to the work of petroleum chemists, a number of products usually derived from natural sources, calcium carbide, or coal tar, are available alternatively from petroleum. Should the demand for coal-tar products, benzene, and toluene, used in manufacture of explosives, among other uses, outstrip national coke-oven capacity, they may be obtained from petroleum.

En el análisis del problema de invertir capital en nuevo equipo, el refinador estudia generalmente el proyecto desde tres puntos de vista: primero, la producción de materiales de mejor calidad, sobre la base de competencia, o sobre la base de nuevas utilizaciones; segundo, la producción de un mayor porcentaje de productos de mejor calidad, y tercero, reducción del costo de producción. La producción de combustibles y lubricantes de superior calidad es esencial para satisfacer la demanda del consumidor y enfrentar la competencia comercial. Es necesario obtener el mayor rendimiento o valor práctico posible de un barril de petróleo crudo y el costo por unidad de producción ha de conservarse bajo a fin de no sufrir un descalabro comercial.

La industria petrolera siempre ha estado dispuesta a invertir sus ganancias en innovaciones o mejoramientos, descartando equipos todavía no amortizados, a fin de ahorrar unos pocos centavos, por unidad, en el costo de explotación, o con el objeto de agregar al producto uno o dos grados de octano para hacerlo más valioso. Este método ha servido de base al admirable progreso que se ha realizado en el arte de la refinación y ha hecho posible la manufactura de combustibles y de otros productos de petróleo de superior calidad, de creciente consumo universal hoy en día.

La industria de la refinería, sin embargo, ha llegado ya al punto de un negocio estable ye de gran competencia comercial. Gradualmente se ha reducido el margen entre el costo neto y el precio de venta. Semejante condición exige un estudio más cuidadoso de los proyectos, antes de ser aprobados. La decisión de descartar una instalación corriente, para valerse de algún nuevo método o procedimiento, se hace sólo después de detenido estudio de todos los factores del caso.

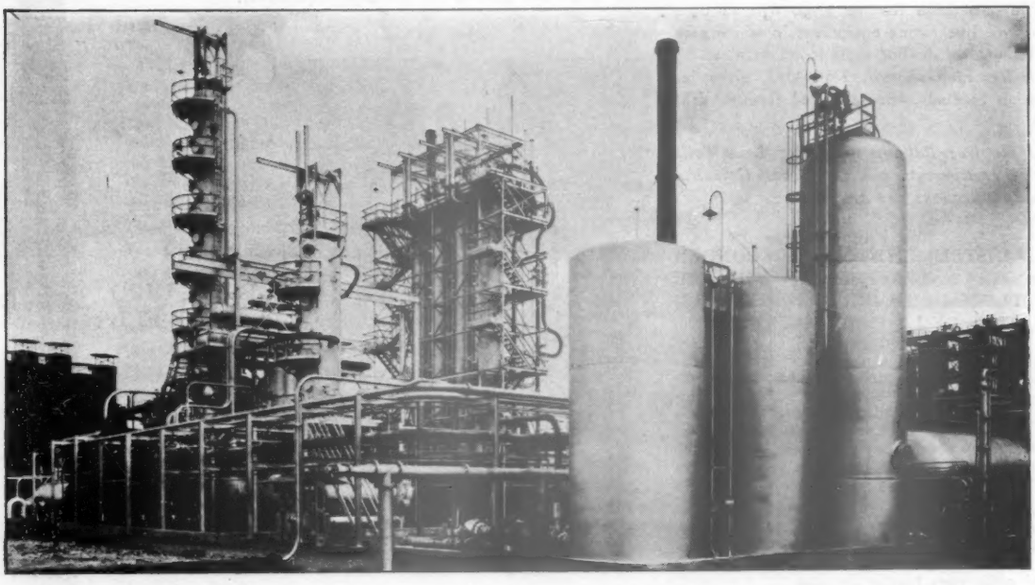
INVESTIGACION

La cantidad de investigaciones que se efectúan en conexión con la utilización de hidrocarburos es enorme, y comprende proyectos de corta duración y de larga duración. Los programas de gran duración se refieren, por lo general, al descubrimiento de nuevos conocimientos fundamentales acerca de productos o de procedimientos. Los nuevos conocimientos, una vez obtenidos, podrán alterar radicalmente alguna práctica de la industria o introducir en ésta algún método totalmente nuevo. Sólo una parte de los proyectos emprendidos requieren años para su realización. Los largos años de minuciosos estudios, los desencantos y los gastos enormes que han precedido a algunos grandes descubrimientos, ponen de evidencia el hecho de que la investigación científica es un trabajo que exige tiempo y concentración contínua.

El refinador con un pequeño cuerpo de investigadores científicos sabe que son muy difíciles de llevar a cabo los proyectos de gran duración, a causa de la perturbación a que están sujetos a consecuencia de las exigencias de la explotación o trabajo corriente. Además, los gastos son cuantiosos. Y con una meta que no puede ser bien avaluada, se hace bien difícil llevar a cabo una profunda investigación científica. Por estas razones, los trabajos de investigación de este caracter, están a cargo de grandes laboratories. Los nuevos procedimientos introducidos en la industria el año pasado confirman, una vez más, que estas organizaciones de investigación científica son en extremo ingeniosas y capaces.

Cuando se toman en cuenta los varios grupos interesados en el progreso de la industria, tales como refinerías particulares empeñadas en resolver problemas de producción, grandes laboratorios dedicados a proyectos de gran duración, instituciones de investigación científica, universidades, oficinas del gobierno, suministradores de equipo y presionales diversos, se verá que es inmenso el esfuerzo productivo. Todo esto ha significado la producción de combustibles y lubricantes para satisfacer toda exigencia, el desarrollo de productos que facilitan nuevas obras o trabajos en otros campos y promesas de nuevas utilizaciones de los hidrocarburos en actividades completamente desligadas de las aplicaciones del petróleo, que ya conocemos.

Veinticinco años ha, la interrupción del abastecimiento de ciertas substancias químicas provenientes de Europa impuso carestías alarmantes en muchas industrias nacionales. Desde entonces, han surgido en nuestro país, procedimientos para satisfacer estas necesidades con recursos propios. En 1914, el petróleo era insignificante como fuente de produc-



Recently completed 7,000,000-cu. ft. nonselective catalytic polymerization plant located in a coastal Louisiana refinery

Instalación de polimerización catalítica no selectiva, de 7.000.000 de piés cúbicos, recientemente hecha en una refinería en la costa de Luisiana

BUILT FOR THE OIL FIELDS
PROVED IN THE OIL FIELDS

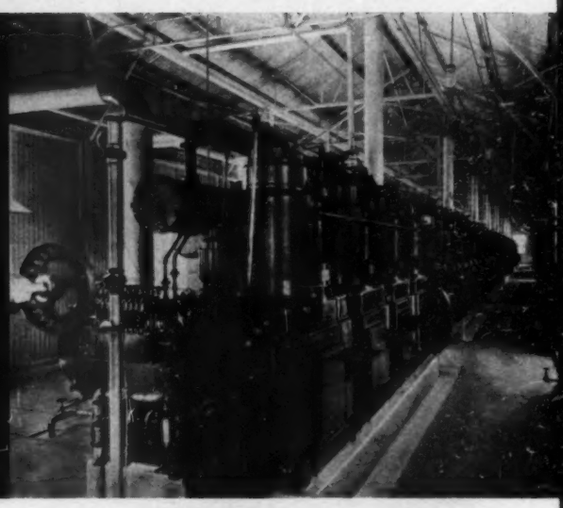
CONSTRUIDOS PARA LOS CAMPOS PETROLIFEROS
DEMONSTRADOS EN LOS CAMPOS PETROLIFEROS

Type G-SC two-cylinder pumping engine, owned by General American Oil Co., Ferguson Lease, East Texas. Rated 25 to 35 hp, at 600 to 800 rpm.

Tipo G-SC de máquina de bombar de dos cilindros, propiedad de la General American Oil Company, Concesión Ferguson, East Texas. Capacidad de 25 a 35 cdf. a una velocidad de 600 a 800 rpm.

Type G-AW two-cylinder gas engine, owned by Carter Oil Company, Beecher City, Ill. Rated 100 to 150 hp, at 225 to 325 rpm.

Tipo G-AW de motor de gas de dos cilindros, propiedad de la Carter Oil Company, Beecher City, Illinois. Capacidad de 100 a 150 cdf. a una velocidad de 225 a 325 rpm.

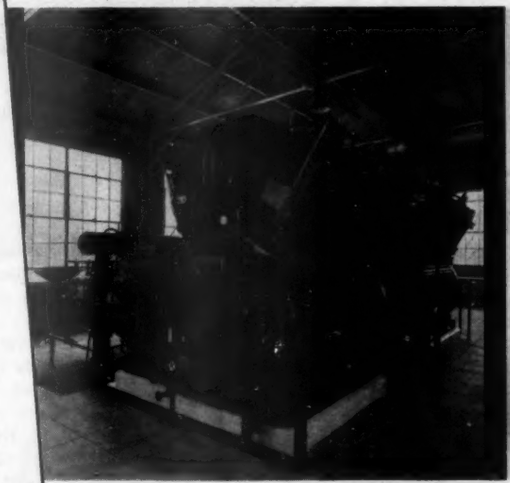


Eight Type G-MR four-cylinder compressor units owned by F. W. Burford, Capps gasoline plant, Miller County, Arkansas. Each rated 300 hp at 300 rpm.

Ocho grupos de compresores de cuatro cilindros, de tipo G-MR, propiedad de F. W. Burford, refinería de gasolina Capps, condado Miller, Arkansas. Cada grupo tiene capacidad de 300 cdf. a una velocidad de 300 rpm.

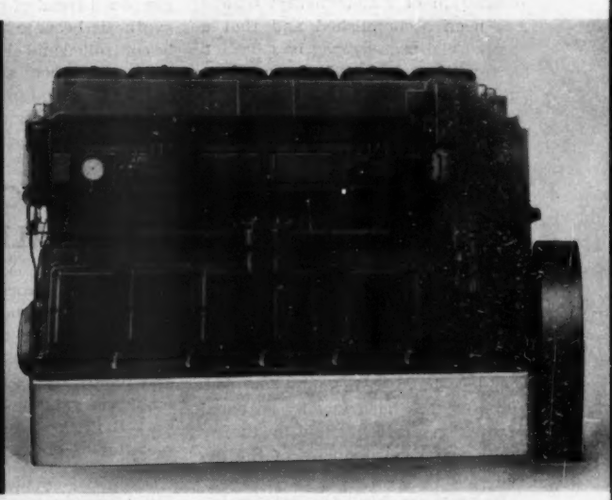
There's a complete range of Cooper-Bessemer gas and Diesel engines and compressors for oil field service . . . 25 to 1650 hp and many of them convertible from gas to Diesel, or Diesel to gas. Every unit is field-proven . . . backed by 106 years of engine-building experience, built to withstand severe service, and economical to operate.

Hay un completo surtido de motores de gas, motores diésel de petróleo y compresores, de marca Cooper-Bessemer, para servicio en campo petrolífero . . . en capacidades de 25 a 1650 cdf. Muchos de ellos son motores de gas convertibles en motores diésel, o motores diésel convertibles en motores de gas. Cada modelo ha demostrado su adaptabilidad, mediante servicio práctico en campos petrolíferos . . . y lleva la experiencia de 106 años dedicados a la fabricación de motores. Todos están construidos para el servicio más exigente y funcionar con máxima seguridad y economía.



Two Type G-MV four-cylinder compressor units, owned by Southern Natural Gas Co., Selma, Ala. Each rated 400 hp at 300 rpm.

Dos grupos compresores de cuatro cilindros, de tipo G-MV, propiedad de la Southern Natural Gas Company, Selma, Alabama. Cada uno tiene capacidad de 400 cdf. a 300 rpm.



Type GN Diesel engine for general oil-field power. Built in 3, 4, 6 and 8 cylinders. Rated 45 to 93 hp per cylinder, at 350 to 750 rpm.

Tipo GN de motor diésel, para fuerza general de campo petrolífero. Se construye en modelos de 3, 4, 6 y 8 cilindros. Capacidad de 45 a 93 cdf. por cilindro, a una velocidad de 350 a 750 rpm.

Pídanos información detallada sobre nuestros motores Cooper-Bessemer de gas y diésel de petróleo, de 15 a 1650 cdf.

WRITE FOR INFORMATION ON COOPER-BESSEMER GAS AND DIESEL ENGINES, 15 to 1650 H

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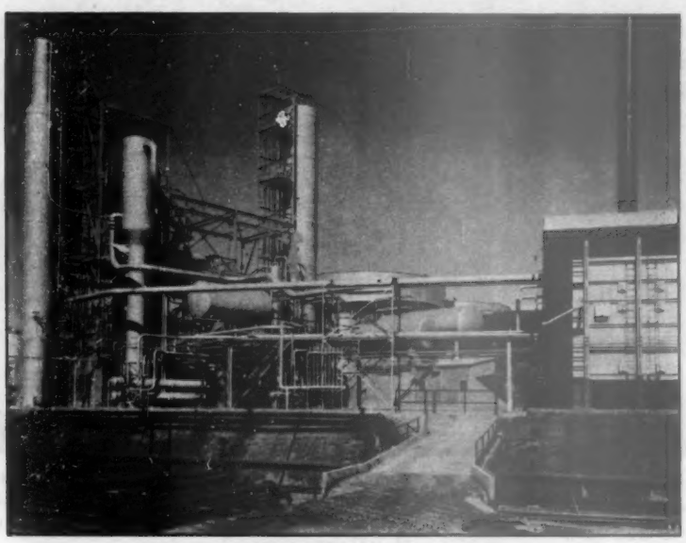
The development of a new process or a major improvement does not stop further effort for advancement, and such a tremendous quantity of work is being done that a discovery is not new for long. In the past few months announcement was made of breaking ground for a new plant for the production of 2,2-dimethyl butane (neohexane), long considered a laboratory curiosity and from which a 115-octane-number gasoline could be made, a value undreamed a year or two ago. Yet a laboratory representative recently stated that small-scale production of 2,2,3-trimethyl butane has been accomplished and that a commercial process may be expected that will produce 125-octane motor fuel.



Furfural unit installed in a California refinery to process lubrication oil

Instalación furfural en una refinería de California, para destilar aceites lubricantes

MADE BY SYNTHESIS

The trend is definitely toward production of fuels and other items by synthesis. The requirements of some machines are such that they can only be served by products made by synthesis, thus forcing improvement in the art. From another viewpoint, the rapid development of synthesis has been from economic causes. The tremendous increase in motor-fuel consumption has been met by an equal production made possible by the invention and development of the pyrolitic or thermal cracking unit.

In breaking down the heavier hydrocarbons with this process, large quantities of cracked gases were made along with the gasoline. The gas represented an economic waste, as it had only fuel value at best. Chemists saw the need of converting this vast reservoir of nonliquid hydrocarbons into useful products that would be more valuable. The discovery of processes to convert these gases into polymer gasoline and isooctane having premium value followed.

It is possible, theoretically, to turn any type of hydrocarbon into any other, and means of doing this have been worked out in many cases, thus laying a foundation for a synthetic chemical industry utilizing petroleum as a base. Such products as alcohols, glycols, explosives, dyes, medicines, synthetic lubricants, rubber, plastics, perfumes, and many others can be produced from petroleum hydrocarbons.

While these things are spectacular, the synthesis of, light hydrocarbons into high-octane gasoline is of immediate interest to the refiner, and happily he has his choice of several newly developed processes. The present broad trend of refining is toward synthesis because the molecules can be controlled and changed to meet definite objectives, and this situation should be borne in mind in considering the discussion on the recent changes in refinery equipment.

EFFECT OF METALLURGY

Many new processes would have never reached the operating stage if it had not been that special metals were devised to stand the pressures and temperatures needed. Too much emphasis cannot be placed on the part that the improvements in the metallurgy of iron and steel have played in the development of modern refinery equipment. Such processes as thermal polymerization would be impossible without equipment of alloy steels that would stand the temperatures and pressures required.

There is no doubt but what research and refinery technicians have reactions in mind now that need only development of the necessary load-carrying steels to put them into the plant. A great deal of research work is being carried out by steel, fabrication, and equipment companies and it is safe to say that most of the problems will be worked out.

tos químicos, pero hoy en día, gracias al trabajo de químicos especialistas en el ramo, se extraen del petróleo numerosos productos que antes se derivaban de fuentes naturales, carburo de calcio o alquitrán de hulla. En caso de que la demanda de productos de alquitrán de hulla, benzina y tulueno, empleados en la fabricación de explosivos, entre otros usos, sobrepase a la capacidad nacional de los hornos de coque, podrán entonces obtenerse del petróleo.

El desarrollo de un nuevo procedimiento o de una importante innovación, no hace cesar el esfuerzo por progresar. Tan enorme en intenso es el trabajo que se está haciendo, que cualquier descubrimiento deja de ser una novedad después de poco tiempo. Estos últimos meses se anunció la construcción de una nueva instalación o planta para la producción de butano dimetílico de 2,2 (neohexano) desde hace tiempo, considerado como una curiosidad de laboratorio, del cual puede hacerse una gasolina de número octano 115, un valor jamás imaginado uno o dos años atrás. Y no sólo esto, sino que hace poco, un representante de laboratorio manifestó que se había ya realizado, en pequeña escala, la producción del butano trimetílico de 2,2,3 y que mediante un procedimiento comercial, se esperaba, de un momento a otro, la producción de combustible de motor de número octano 125.

HECHO POR SINTESIS

La tendencia es definitivamente hacia la producción de combustibles y otros materiales, por el procedimiento de la síntesis. Los requisitos de ciertas máquinas son tales que sólo pueden servirse por productos hechos por síntesis, lo cual impone como obligación, el mejoramiento de este arte. Por otra parte, el rápido desarrollo de la síntesis se ha debido a razones económicas. El aumento enorme en consumo de combustible ha sido satisfecho mediante una correspondiente producción hecha posible por el invento y desarrollo de la unidad o equipo de destilación ("cracking") por desintegración pirolítico o termnal.

En la separación de los hidrocarburos más densos, mediante este procedimiento, se hicieron grandes cantidades de gases desintegrados conjuntamente con la gasolina. Estos gases representaban un desperdicio económico, a causa de que tenía un valor de combustible, a lo mejor. Los químicos vieron la necesidad de convertir este enorme depósito de hidrocarburos no líquidos en productos útiles, que fueran más valiosos. El resultado fué el descubrimiento de procedimientos para convertir estos gases en gasolina polimera e isooctano de gran valor práctico.

En teoría es ahora posible convertir cualquier tipo de hidrocarburo en cualquier otro, y en muchos casos se han perfeccionado los medios para hacerlo, estableciéndose así la base para una industria química sintética apoyada sobre el petróleo como fuente fundamental. Productos tales como alcoholes, glicoles, explosivos, tintes, medicinas, lubricantes sintéticos, caucho, plásticos, perfumes y muchos otros, pueden producirse de hidrocarburos de petróleo.

Todas estas cosas son espectaculares, pero la síntesis de los hidrocarburos volátiles convertidos en gasolina de alto número octano es de inmediato interes para el refinador, quien tiene, afortunadamente, a su disposición, varios procedimientos de reciente desarrollo. La presente tendencia general, en materia de refinación, es hacia la síntesis, a causa de que las moléculas pueden gobernarse y cambiarse, para que respondan a objetivos definidos, y esta situación deberá tenerse presente en la discusión de los recientes cambios en equipo de refinería.

EFECTO DE LA METALURGIA

Muchos nuevos procedimientos nunca habrían llegado al grado de explotación práctica si no hubiera sido por la introducción de metales especiales para resistir las presiones y temperaturas requeridas por los nuevos métodos. No se puede acentuar demasiado el importante papel que los avances en la metalurgia del hierro y acero han desempeñado en el desarrollo del moderno equipo de refinería. Procedimientos como el de la polemerización termal habrían sido imposibles sin la ayuda de equipos de aleaciones de acero capaces de resistir las extraordinarias temperaturas y presiones requeridas.

No cabe la menor duda de que las adicionales reacciones que tienen en mente los ingenieros de investigación y técnicos de refinería, necesitarán para su completa realización práctica, sólo el desarrollo de ciertas aleaciones de acero capaces de resistir ciertas cargas o tensiones. Un gran trabajo de investigación se está llevando a cabo entre las compañías de acero, de fabricación y de equipos, y se puede anticipar, con seguridad, que la mayor parte de los problemas que se presentan actualmente será resuelta dentro de poco.

METALES Y ALEACIONES

Una refinería completa, de tipo moderno, impone una gran variedad de condiciones de presiones y temperaturas, sobre los metales empleados en su varios elementos de equipo. En el caso de las temperaturas, éstas bajan hasta 60 grados Fahrenheit bajo cero, en conexión con los precedimientos de desparafinaje, y suben a máximas extraordinarias en ciertos tipos de unidades de polemerización o de alcalización termal.

Las elevadas presiones y temperaturas que se desarrollan en en los alambiques tubulares de varios pro-

The REED Non-Lubricated PLUG VALVE

THE REED NON-LUBRICATED PLUG VALVE is opened or closed by a single operation—a quarter turn of the valve stem. The body, bonnet, packing, and stem are of conventional design, but the plug, integral with the stem, is cylindrical. The plug is positioned within a corresponding cylindrical bore in the body, but does not contact it. THE SEALING MEMBERS ARE TWO OPPOSED SEGMENTS WHICH FLOAT IN POCKETS IN THE PLUG. The plug segments are lifted from their seats before they are moved to the open position, minimizing friction and assuring ease of operation. NO LUBRICATION IS NEEDED because breaking the segment seal relieves fluid pressure, and this action reduces segment sliding friction to a minimum while the valve is being opened.

LA VALVULA DE OBTURACION REED SIN LUBRICACION se abre o cierre con facilidad—un cuarto de vuelta al vástago de la válvula. El cuerpo, la cabeza, la empaquetadura y el vástago, son de tipo corriente, pero el tapón, que forma parte integrante del vástago, es cilíndrico. El tapón está colocado dentro de un correspondiente cilindro en el cuerpo, pero sin hacer contacto con éste. LOS MIEMBROS DE CIERRE SON DOS SEGMENTOS OPUESTOS, QUE FLOTAN EN CAVIDADES EN EL TAPON. Los segmentos del tapón son levantados de sus asientos antes de ser movidos a su posición de abertura, lo cual reduce a un mínimo el rozamiento y asegura fácil funcionamiento. NO SE NECESITA LUBRICACION, pues abriendo el cierre de los segmentos se modera la presión hidráulica y esta acción reduce el rozamiento o fricción de resbale de los segmentos a un mínimo, mientras se está abriendo la válvula.

THE EASIEST OPERATING PLUG VALVE ON THE MARKET

LA VALVULA DE OBTURACION DE MAS FACIL MANEJO DEL MERCADO

FURNISHED IN SCREWED OR FLANGED TYPES OF STANDARD RATINGS AND MATERIALS.

SE SUMINISTRA EN TIPOS ROSCADOS O DE BRIDA, EN CAPACIDADES Y DE MATERIALES CORRIENTES O NORMALES.

A GENERAL PURPOSE VALVE FOR OIL FIELDS—REFINERIES AND INDUSTRIAL PLANTS

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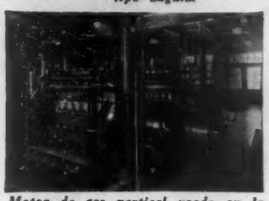
EQUIPOS WORTHINGTON para INDUSTRIA PETROLERA

Compresor con motor de gas, de tipo angular



Motor de gas vertical usado en la generación de fuerza

Motor diésel, que puede convertirse en motor de gas, usado en la generación de fuerza

Compresores de amoniaco de dos pasos, accionados por motor

Compresores de aire con transmisión por correas múltiples en "V"

Bombas triples horizontales de gasolina

Bomba colectora accionada por motor de gasolina

Bomba giratoria con transmisión de tipo automóvil, en línea de tubería colectora

Bomba de movimiento alternativo, de petróleo caliente, accionada por motor diésel

Compresores accionados por motores de gas en una línea de tubería de gas natural

Motor de gas vertical

Compresores de gas de un paso, tipo horizontal, accionados por máquina de vapor

Bomba centrífuga accionada por motor, para abastecimiento de agua y servicio de transferencia

Bombas dúplex de vapor, para servicio de cementación de pozo

Bomba sencilla HiVoL horizontal para líquidos muy volátiles

Bomba centrífuga para línea de tubería de petróleo

BOMBAS CENTRIFUGAS PARA REFINERIAS—Para todo trabajo de refinería de petróleo, incluyendo el manejo de cargas, calientes bajo alta presión.

BOMBAS CENTRIFUGAS—DE VARIOS GRADOS, DE ALTA PRESION—Para líneas de tubería de petróleo y gasolina, extracción hidráulica del petróleo en el coque, alimentación de calderas y todo servicio sometido a presión.

BOMBAS CENTRIFUGAS PARA SUBSTANCIAS QUIMICAS—Para ácidos, álcalis, disolventes y otras substancias químicas empleadas en procedimientos de refinería.

BOMBAS CENTRIFUGAS PARA SERVICIO GENERAL—Para todo servicio industrial, centrales de fuerza, industrias de tratamientos especiales, edificios, contratistas, etc.

BOMBAS DE TURBINA PARA POZOS—Para abastecimiento de agua, drenaje o desagüe, desecación y otros servicios similares.

BOMBAS DE VAPOR—Bombas simples y dúplex de acción directa, para alimentación de calderas, servicio general, alta presión, petróleo caliente y frío, aplicaciones marinas, etc. De todo tipo, horizontal y vertical.

BOMBAS DE FUERZA MECANICA—Para líneas de tubería colectora y anegación, para transmisión de petróleo y gasolina por líneas de tubería, para servicio de cargas frías y calientes en refinerías, trabajo de prensa hidráulica, alimentación de calderas y diversos servicios de abastecimiento de agua y transferencia de líquidos.

BOMBAS GIRATORIAS—De desplazamiento positivo, para la transferencia de líquidos no corrosivos de varias viscosidades; propulsión por motor, correa, turbina o máquina de vapor.

COMPRESORES DE AIRE Y DE GAS—*Tipos fijos*—Horizontales, verticales y en ángulo, de uno y de más pasos o etapas. De todo tamaño; propulsión por motor eléctrico, máquina de vapor, motor diésel de petróleo o motor de gas.
Tipo de automóvil—Para garajes y estaciones de servicio.
Portátiles—De dos pasos—en todo tipo de montaje. Propulsión por motor de gasolina, diésel de petróleo o motor eléctrico.
De vagón ferroviario—De dos pasos, con propulsión por motor de gasolina, diésel de petróleo o motor eléctrico.

HERRAMIENTAS NUEMATICAS DE CONSTRUCCION Y BARRENAS PARA ROCA—Azadones para arcilla, zanjadoras, apisonadoras, rompedoras de pavimento, perforadoras de roca, perforadoras de agujeros horizontales, perforadoras de carrito, etc. Hornos de forjar y máquinas de tratamiento térmico para acero de brocas o barrenas.

MOTORES DIESEL—Tipos verticales, de cuatro tiempos, de inyección directa e inyección de aire, para servicio general, para accionar generadores y bombas, para propulsión marina y para servicio de línea de tubería.

MOTORES DE GAS—Horizontales de cuatro tiempos de doble acción y verticales de cuatro tiempos de acción simple, para servicio general de fuerza motriz, para accionar generadores y para compresores de línea de tubería de gas.

MOTORES DIESEL CONVERTIBLES EN MOTORES DE GAS—Verticales de cuatro tiempos, que pueden convertirse con facilidad en motores de gas o de aceite combustible.

TURBINAS DE VAPOR—De todo tipo para propulsión de generadores y otros equipos.

ENGRANAJES DE CAMBIO DE MARCHA—Para reducir y para aumentar la velocidad.

TRANSMISIONES POR CORREA EN "V" *(Propulsión Multi-V)*—Poleas con ranura en "V", correas Goodyear. Transmisiones completas o las correas solamente.

CONDENSADORES DE VAPOR—En tipos de superficie, barométricos y de chorro, en una escala completa de capacidades. Sistemas completos, con bombas auxiliares, eyectores, etc.

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Bombas centrífugas de un grado de aspiración, en una refinería de gasolina y propano

Bomba centrífuga de carga caliente, accionada por motor de gas

Enfriadoras de amoniaco, por el sistema de dilatación directa

Bombas de vapor simples y dúplex en una refinería de petróleo

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Bombas mecánicas dúplex horizontales, dedicadas a la represión o reinyección con agua

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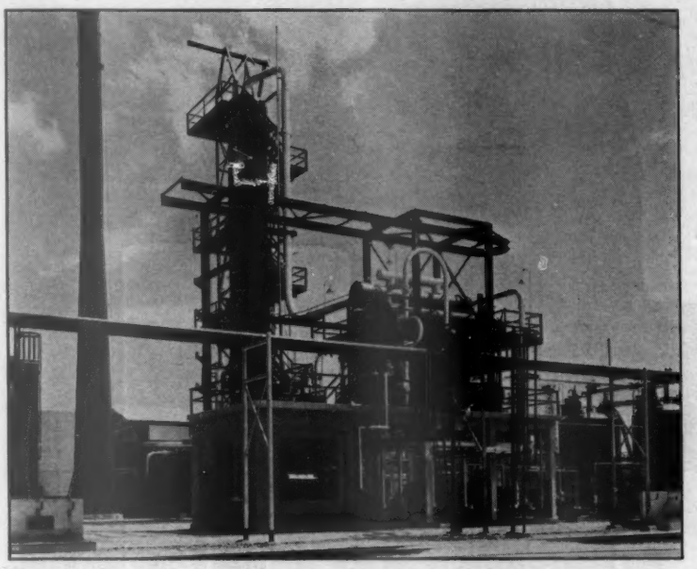
METALS AND ALLOYS

A complete refinery of modern design places a great variety of pressure and temperature conditions upon the metals used in various pieces of equipment. These range from temperatures down to —60° F. reached in some dewaxing processes to the very high pressures and temperatures reached in certain types of polymerization or thermal alkylation units.

The very high pressures and temperatures reached in the tube stills of various processes create a demand for materials of better strength and oxidation resistance. The production of high-sulfur crudes in certain areas and the acidizing of oil wells have accentuated the corrosion problem. Tube-still steel has to meet the problems of oxidation, corrosion, and strength of materials.



New atmospheric distillation unit of 6,000-bbl. per day capacity

Nueva instalación de destilación atmosférica, de 6.000 barriles por día, de capacidad

Chromimum is a most effective alloying element to add corrosion resistance to steel and is also outstanding in the matter of imparting oxidation resistance to tubes at elevated temperatures. It has been found that the characteristics of steel including chromium can be improved by addition of certain other elements. The oxidation and corrosion resistance is increased by the addition of silicon or by adding both silicon and aluminum. Aluminum is of value in decreasing the air hardening characteristics when used in the alloy. Silicon will retard scaling of tubes at high temperatures.

There are two generally accepted test methods for determining the strength of steel, these being the creep test and the stress-rupture test. They differ in that stresses in the creep test are relatively low, whereas in the rupture test, high stresses are used. Molybdenum is found to be especially useful in improving strength at high temperatures. Carbon, chromium, columbrium, tungsten, and vanadium are other elements reported to increase strength. Molybdenum is also effective in eliminating susceptibility to temper embrittlement. Vanadium, in combination with chromium, also has a good effect in imparting resistance against hydrogen penetration under high temperature and pressure conditions. The tendency at the present time in the selection of metals for severe corrosive conditions is toward chromium-molybdenum steels with a chromium content of more than 6 per cent.

Consideration must be given to the impact resistance as well as to the ductility characteristics in studying the ductility of cracking-still tubes after long service. The reason for this is that the tubes may be subjected to impact stresses during cleaning operations. Straight chromium steels and certain modifications frequently exhibit this shortcoming. To overcome this, molybdenum must be used as it is the only known element that will perform this function.

As an example of the possibilities in various alloys, it is related that a research project in one laboratory was to develop an alloy that could be used in place of platinum in the filaments of radio tubes. The developed alloy contained nickel, cobalt, titanium, iron, manganese, aluminum, silicon, and carbon. Attention was then paid to the problem of adapting it to other applications where resistance to creep was needed. Chromium was added and after temper-hardening, a new alloy was formed of remarkable characteristics. Tests indicate that the new alloy is stronger at 1,100° F. than ordinary carbon steel is at room temperature.

Recent developments in fabrication of condenser tubes comprise the addition of small amounts of anti-

(Continued on Page 276)

cedimientos establecen demanda de materiales de mayor firmeza y gran resistencia a la oxidación. La destilación de petróleos crudos de alto contenido de azufre, en ciertas regiones, y la acidación de pozos de petróleo, han acentuado el problema de la corrosión. El acero de alambique tubular tiene que enfrentar el problema de la oxidación, corrosión y resistencia de materiales.

El cromium es un muy efectivo elemento de aleación para impartir al acero adicional resistencia a la corrosión y es también muy notable por su propiedad de dar a los tubos expuestos a elevadas temperatura una extraordinaria resistencia contra la oxidación. Se has visto que las características del acero mezclado con cromo pueden mejorarse con la adición de otros elementos. La resistencia a la oxidación y corrosión se aumenta con la adición de silicio o con la de silicio y aluminio. El aluminio es de valor en la reducción de las características de endurecimiento al aire cuando se usa en la aleación. El silicio tiende a retardar la incrustación de los tubos sometidos a altas temperaturas.

Hay dos métodos, de general aceptación, para averiguar la firmeza del acero. Estos métodos de ensayo son el llamado de "arrastre" y el de ruptura bajo tensión. Se diferencian en que las tensiones en el ensayo de arrastre son relativamente bajas, mientras que son el ensayo de ruptura bajo tensión son elevadas. Se ha visto que el molibdeno es especialmente útil en mejorar la firmeza a altas temperaturas. El carbono, cromo, columbrio, tungsteno y vanadio son otros elementos que tienen también la propriedad de aumentar la firmeza del acero. El molibdeno tiene, además, gran efectividad para eliminar la susceptibilidad del acero a la fragilidad del temple. En vanadio, en combinación con el cromo, tiene también un buen efecto en impartir al acero resistencia contra la penetración de hidrógeno, bajo alta temperatura o elevada presión. La tendencia, al presente, en la elección de metales para severas condiciones corrosivas, es hacia las aleaciones de acero, cromo y molibdeno, con un contenido de más de 6% de cromo.

Debe darse consideración a la resistencia al choque, lo mismo que a las características de ductibilidad, en el estudio de la ductibilidad de los alambiques tubulares empleados en la destilación por el procedimiento "cracking," después de largo tiempo de servicio. La razón de esto es que los tubos pueden someterse a tensiones de choque durante las operaciones de limpieza. Las aleaciones sencillas de acero y cromo, lo mismo que algunas de las modificadas, exhiben este defecto. Para sobreponerse a esta deficiencia, ha de usarse molibdeno, pues es el único elemento conocido, que puede desempeñar esta función.

Como ejemplo de las posibilidades en varias aleaciones, se relata que un proyecto de investigación, en un laboratorio, tuvo por fin el desarrollo de una aleación, que pudiera emplearse en lugar del platino empleado en los filamentos de tubos electrónicos de radiorreceptores. La aleación desarrollada contenía níquel, cobalto, titanio, hierro, manganeso, aluminio, silicio y carbono. Se dió luego atención al problema de adaptarla a otras aplicaciones en que se necesita resistencia al "arrastre." Se le agregó cromo y después de recibir temple duro, la aleación resultó en úna de notables características. Los ensayos indican que esta nueva aleación es más resistente a 1.100 grados Fahrenheit, que la de acero al carbono, a temperatura de sala.

Entre los recientes desarrollos en la fabricación de tubos de condensadores se comprende la adición de pequeñas cantidades de antimonio y arsénico al latón "admiralty," para mejorar su resistencia a la corrosión. Se espera que este tipo de latón con antimonio aumentará más aún la duración y eficacia de los tubos de aleación de cobre.

Se ha acostumbrado revestir las cámaras de reacción con varios tipos de forros, para reducir la corrosión. Casi todos ellos son de caracter no metálico, debido a su bajo costo, pero necesitan renovarse con frecuencia. Posiblemente se justifica ahora, por su economía, el uso de forros de chapas de cromo, pues su duración es tan prolongada que compensa ventajosamente su costo inicial más subido.

A pesar de que no se han construido grandes receptáculos de varias capas, hay, sin embargo, interes en este nuevo método de fabricación de recipientes de alta presión. Se han aplicado en conexión con la hidrogenación a altas temperaturas, separación de gas, procedimientos químicos a alta presión, almacenaje de gas de alta presión y otros procedimientos.

La construcción consiste en arrollar sucesivas capas de acero alrededor de un cilindro, apretándolas luego y finalmente soldándolas. Las secciones se ensamblan y soldan como si fueran secciones de pared maciza. Una ventaja de este método es que la capa más interior puede ser de material resistente a la corrosión, mientras que las ótras pueden ser de acero más barato. El desahogo de tensión no es necesario.

COMBUSTIBLES DE OCTANO ALTO

Sin casi una pausa, cada año ha presenciado números promedios de octano sucesivamente más altos, en los combustibles para motores. Concomitante con este progreso ha venido un aumento contínuo en la relación de compresión de los motores de automóviles. El refinador nunca va muy adelante en la marcha para suministrar combustibles adecuados. Hoy en día, el número promedio de

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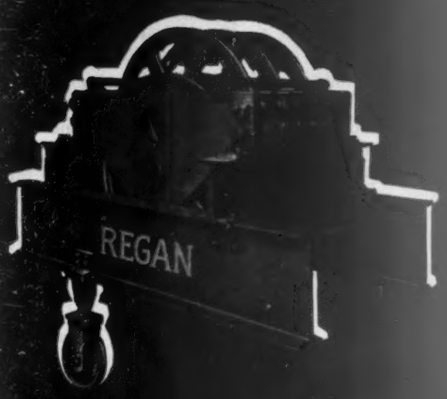
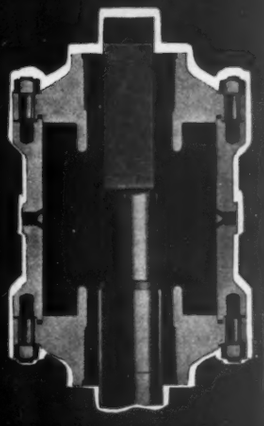
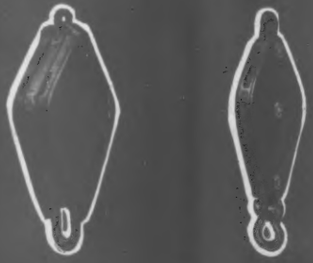
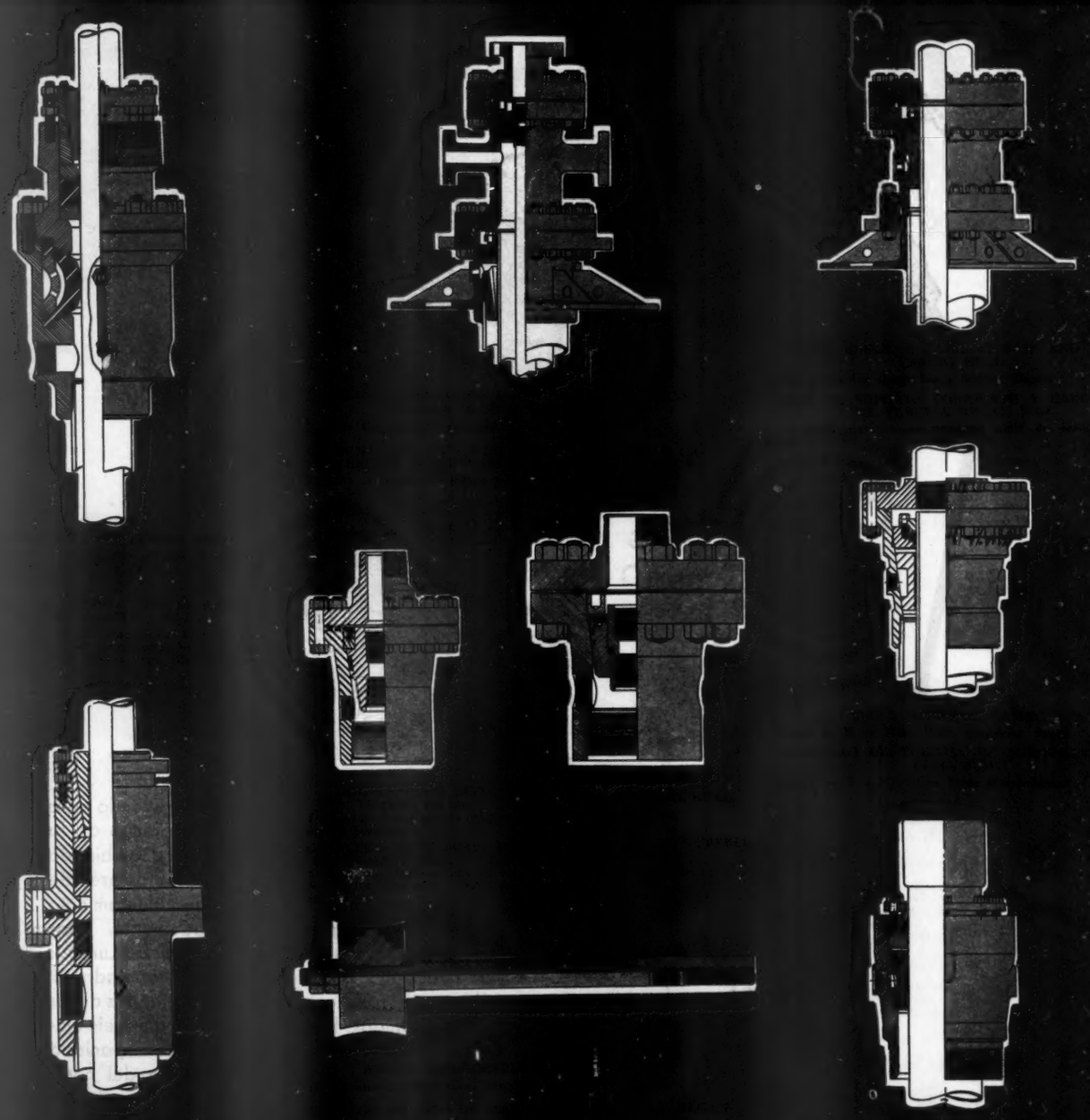
LINE-UP WITH THE QUALITY HOOK-UP..







P.....IT'S REGAN ALL THE WAY



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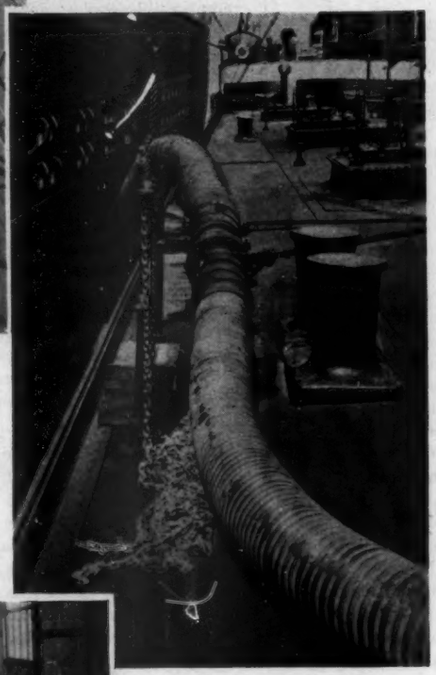

Speeding liquid horsepower on its way. Fuel oil being transferred from barge to steamer through "U. S." Amazon Oil Suction and Discharge Hose.

Acelerando la fuerza motriz líquida en su camino. Transferencia de aceite combustible de una barca a un vapor, con la ayuda de una bomba de aspiración y descarga Amazon de la U.S. Rubber.

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Bombando lodo bajo tremenda presión de pulsación en la perforación de pozo profundo . . . con la manguera giratoria Matchless. Cargando y descargando petróleo o gasolina, de muelle a buque tanque, o vice versa . . . con la manguera de aspiración y descarga Amazon. Manejando petróleo y derivados de petróleo de la refinería a la línea de tubería, vagones tanques y buque tanque . . . con una variedad de mangueras y empaquetaduras de bombas U.S. Rubber. Acelerando la descarga de gasolina, gracias a su suave tubo de caucho sintético, de la bomba de acero al vagón tanque . . . con la manguera de gasolina Peerless. Todas están ocupadas . . . y haciendo muy bien su trabajo, porque los ingenieros de la U.S. Rubber están intimamente al corriente de todo lo relativo al petróleo.

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El manejo de líquidos volátiles es peligroso. Por esta razón, las modernas estaciones de bombas emplean sólo las mejores empaquetaduras. La presente estación de bombas está completamente equipado con empaquetaduras "U.S."

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Retuérzala . . . . dóblela . . . . cuando hace calor o mucho frío . . . . la manguera de gasolina, con tubo o forro de caucho sintético, U.S. Peerless, es siempre flexible.

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mony and arsenic to admiralty brass to improve its corrosion resistance. It is expected that antimonial admiralty will still further increase the life and efficiency of copper alloy tubes.

It has been customary to line reaction chambers with various types of linings to reduce corrosion. Most of these are of nonmetallic nature due to their low cost, but have to be frequently replaced. It is possibly economically justified to use chromium sheet linings, for while their cost is high, their life is much longer.

While no large vessels of multilayer construction have been built, there is interest in this new method of fabricating high-pressure vessels. Application has been made in hydrogenation at high temperatures, gas separation, high-pressure chemical processes, high-pressure gas storage, and other processes.

The construction consists in wrapping successive layers of steel around a cylinder, tightening them and welding them. The sections are assembled and welded as solid-wall sections would be. An advantage to this method is that the innermost layer may be of corrosion-resistant material while the other layers are of cheaper steel. Stress relieving is not necessary.

HIGH-OCTANE FUELS

With hardly a pause, each year has seen successively higher average octane numbers in motor fuels. Concomitant with this advance has been the steady increase in compression ratio of automobile motors. The refiner is never very far ahead in the fight to supply adequate fuels. Today the average octane number of housebrand gasolines in this country is probably between 73 and 74 and many predictions are heard that this will be raised to 75 or 76 in the very near future.

The use of tetraethyl lead has made this overall increase in antidetonation property possible. However, there is a limit to the use of lead, and to give the best performance, the base gasoline must have certain inherent antiknock properties of its own. As the final octane number is raised, the base octane number must also be raised in keeping with the trend.

In the aviation-gasoline field, the advance in octane number has been much more remarkable. The jump from 75 to 87 had hardly become general when 100-octane-number fuel came into production. Such fuel, permitting higher payloads in commercial aviation and higher speeds in war aircraft, was eagerly adopted and is rapidly becoming standard. Outbreak of war in Europe, and its possible implications, has considerably heightened the interest in premium-grade aviation fuels. As an example of the progress being made, it is expected that by the end of this year, it will be possible to produce aviation fuel of 115-octane number. It is reported that an engine is already designed and waiting for the fuel.

There is little wonder that the production of high-octane number fuels has engaged the most earnest attention from refiners. Many new processes are either in operation or going through the research department looking toward the production of higher octane fuels. The products made go into either motor or aviation fuels as the case may be.

The standard methods of making gasoline must be augmented. Distillation, fluid flow, and heat transmission unit operations are no longer adequate. Their place is being taken by new unit processes, such as catalytic cracking, alkylation, hydrogenation, dehydrogenation, isomerization, cyclozation, and aromatization. Some discussion of these various processes is merited in light of their known and potential possibilities.

octano para las gasolinas de consumo corriente, en este país, es probablemente entre 73 y 74, y se oyen muchas predicciones de que que se aumentará a 75 o 76 dentro de poco.

El uso del tetraetilio de plomo ha hecho posible este completo aumento en propiedad antidetonante. Hay, sin embargo, un límite para el uso del plomo, y para asegurar un mejor rendimiento, lo gasolina básica debe tener ciertas inherentes propiedades antidetonantes ella misma. En consecución de esta tendencia, el número octano de la gasolina básica ha de aumentarse cada vez que se aumente más el número octano final del combustible.

En el campo de la gasolina para motores de aviación, el avance del número octano ha sido todavía más notable. El salto de 75 a 87 vino muy pronto seguido por la producción de combustible con número octano 100. Semejante combustible, por permitir mayores cargas útiles en la aviación y mayores velocidades en aviones militares, fué adoptado en el acto y se está rapidamente conviertiendo en el tipo de norma. La declaración de guerra en Europa, y sus posibles implicaciones, ha enaltecido grandemente el interes en combustibles de primer orden para los fines de aviación. Como ejemplo del progreso que se está realizando en este sentido, se espera que a fines de este año será posible producir un combustible de aviación con número octano 115. Se dice que existe ya un motor especialmente proyectado para funcionar con semejante combustible.

Es, por lo tanto, muy lógico que la producción de combustibles de elevado número octano haya despertado el más intenso interes entre los refinadores. Por esta razón, están ya en funcionamiento, a bajo estudios de laboratorio, varios procedimientos nuevos, encaminados todos a la producción de combustibles de mayor número octano. Los productos fabricados por los nuevos procedimientos se utilizan no sólo en motores de aviación, sino también en motores corrientes de automóviles.

La producción de gasolina requiere, para su aumento, cambios en los médos corrientes. Los procedimientos ordinarios de destilación, corriente flúida y transmisión de calor, en grupo, no son ahora adecuados a las necesidades modernas. En su lugar se están usando nuevos procedimientos unitarios, tales como el "cracking" catalítico, alkalización, hidrogenación, deshidrogenación, isomerización, ciclozación y aromatización. Estos procedimientos merecen cierta discusión, en vista de sus posibilidades conocidas y posibles potencialidades.

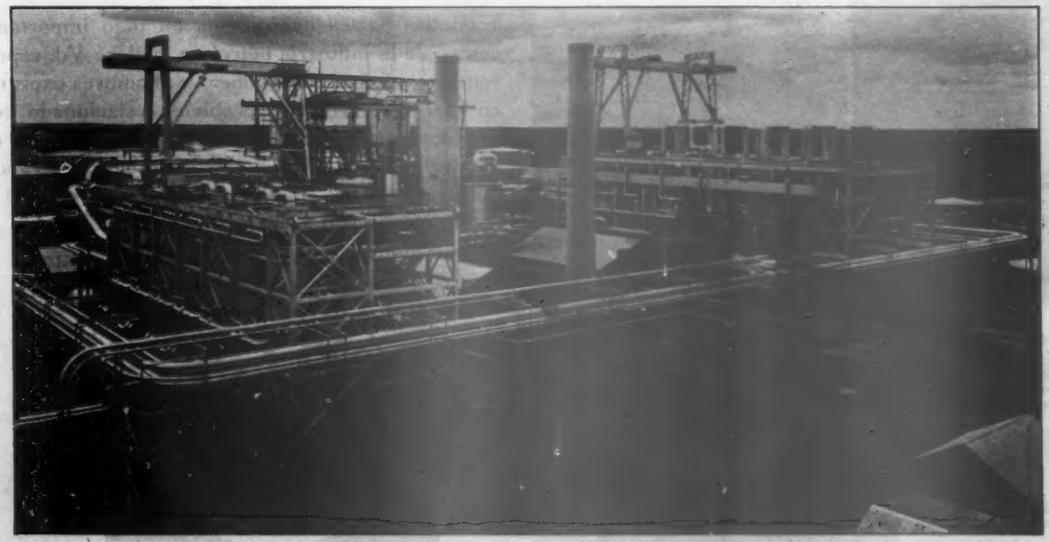
"CRACKING" TERMAL

El método más antiguo y generalizado de producir gasolina de número octano relativamente alto, es el de "cracking" termal. La instalación de destilación primaria parcial encuentra dificultad para continuar en existencia cuando tiene que competir con establecimientos que siguen el procedimiento de "cracking" o destilación por desintegración. Para satisfacer la demanda de los automóviles modernos, es necesario mezclar una gran cantidad del material obtenido por el procedimiento de "cracking," introduciéndolo en el combustible final. Como los requisitos antidetonantes de los motores de automóviles continúan en aumento, habrá constante necesidad de intensificar más la destilación por desintegración o "cracking" y la reformación de las naftas de bajo número octano.

Las nuevas refinerías o destilerías que se están construyendo, lo mismo que los importantes proyectos de modernización de plantas o instalaciones antiguos, incluyen, casi invariablemente, la erección de unidades de combinación, debido a los reducidos gastos de explotación y mejor rendimiento que éstas ofrecen. La construcción de instalaciones separadas de unidades de "cracking" termal, ha sido descuidada, precisamente a causa de ésto. Sin embargo, se está realizando un gran trabajo en este sentido, que tiene por fin la utilización de unidades capaces de asegurar un rendimiento aumentado, un costo de explotación reducido y una producción de combustibles de mayor número octano.

Probablemente el mayor progreso en este sentido ha sido la modernización de lás unidades antiguas. Los serpentines sencillos se están transformando en serpentines dobles selectivos; se están instalando mejores hornos y se está estableciendo mayor flexibilidad de funcionamiento en todo sentido.

El cambio más reciente se presenta en conexión con la coquificación de tipo contínuo. Las cámaras de coquificación están dispuestas dentro de la



New 10,000-bbl. per day Houdry unit located in a New York refinery

Nueva instalación Houdry de 10.000 barriles por dia, añadida a una refinería en Nueva York

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BAROID is a drilling fluid material manufactured from specially selected and processed barytes. It has a very fine particle size and a specific gravity of 4.2—almost twice that of ordinary clay and more than four times that of water. It is unexcelled for use in drilling fluid to control gas, oil, or water pressures and to help hold caving formations in place. Only a small amount of colloidal material is required to keep BAROID from settling and to hold it in suspension indefinitely. It is chemically inert, non-abrasive, and non-corrosive. It may be used without fear of damage to slush pump liners and other metal parts with which it comes in contact. Field experience has demonstrated that fewer tools are stuck when BAROID is used than with any other weighting materials.

BAROID es un material para aumentar el peso del lodo de perforación, hecho de baritina escogida de especial preparación. Tiene un tamaño de partícula muy fino y un peso específico de 4,2, casi el doble de el de la gresa ordinaria y más de cuatro veces mayor que el del agua. Resulta insuperable cuando se usa con el líquido de perforación, para gobernar las presiones del gas, petróleo o agua y para ayudar a mantener en su sitio las formaciones derrumbadas. Se requiere sólo una pequeña cantidad de material coloidal para impedir que el BAROID se precipite y mantenerlo en suspensión indefinidamente. Es químicamente inactivo, no es raspante o abrasivo ni oxidante. Puede usarse sin temor de daño a los manguitos o revestimientos de las bombas de lodo o de tras piezas metálicas con las cuales tenga contacto. La experiencia práctica ha comprobado que menos herramientas quedan retenidas con BAROID que con todo otro material aumentador de peso.

AQUAGEL is a trouble-proof drilling clay prepared from our own carefully selected, sized and processed bentonites which contain a high percentage of gel-forming colloids. These gel-forming colloids are responsible for most of the desirable qualities in a drilling fluid. As a result, AQUAGEL muds deposit only a thin, easily-removable cake on the walls of the hole and allow only a small amount of water to penetrate the formation. Consequently, the use of AQUAGEL muds promotes faster drilling and earlier completions because of freedom from caving and stuck drill pipe, and augmented production because of the absence of water from the drilling mud in potential producing zones.

AQUAGEL es una greda de perforación preparada de bentonitas cuidosamente elegidas y tratadas, que contienen un alto porcentaje de coloides formadores de gelatina. Estos coloides gelatinosos introducen las más convenientes y apetecidas propiedades en el líquido de perforación. Por esta razón, AQUAGEL deposita un delgada capa o cubierta, de fácil limpieza, sobre las paredes del agujero y permite la penetración de sólo una pequeña cantidad de agua en la formación. Por consecuencia, el uso de AQUAGEL acelera la perforación y la terminación del agujero, evitando el derrumbe y retención o atascamiento del tubo de perforación, aumentando también la producción debido a la ausencia de agua del lodo de perforación en zonas de producción potencial.

STABILITE is an excellent chemical for reducing the viscosity and gel-strength of thick drilling fluids and at the same time enhancing their wall-building qualities and freeing entrained gas. By the use of STABILITE, heavy mud, STABILITE is non-abrasive and non-corrosive and offers no danger from over-treatment.

STABILITE es una excelente sustancia química para reducir la viscosidad y fuerza gelatinosa de los espesos líquidos de perforación, y al mismo tiempo, para acentuar sus propiedades de retención de pared y libertar el gas tapado. Mediante el uso de STABILITE, los lodos espesos pueden mantenerse a viscosidades de trabajo. El efecto del STABILITE es más durable que el de todo otro material químico ordinariamente usado para el tratamiento del lodo. STABILITE no es raspante ni oxidante y no ofreco peligro alguno de daño en caso de mucha aplicación.

BAROID PRODUCTS

BAROID and COLOX—Extra-Heavy Drilling Muds.
AQUAGEL—Trouble-Proof Colloidal Drilling Mud.
STABILITE—An Improved Chemical Mud Thinner.
BAROCO—An Economical, Salt Water-Resisting Drilling Clay.
FIBROTEX—For Preventing or Regaining Lost Circulation.
AQUAGEL FOR CEMENT—For setting Casing and Restoring Lost Circulation.
SMENTOX—For Reconditioning Cement-Cut Muds.
ZEOGEL—A Special Clay to be Used as a Suspending Agent When Salt or Salt Water is Encountered.
TESTING EQUIPMENT—For Drilling Mud Analysis and Control.
BAROID WELL LOGGING SERVICE—Formation Information Through Mud Analysis.

PRODUCTOS BAROID

BAROID y COLOX—Lodos de perforación extra espesos.
AQUAGEL—Lodo coloidal de perforación, a prueba de irregularidades.
STABILITE—Un perfeccionado producto químico para diluir el lodo.
BAROCO—Una greda de perforación económica y resistente al agua salada.
FIBROTEX—Para impedir o para recobrar la circulación perdida.
AQUAGEL PARA CEMENTO—Para fijar la tubería y restablecer la circulación perdida.
SMENTOX—Para reacondicionar los lodos mezclados con cemento.
ZEOGEL—Una greda especial, que se usa como agente de suspensión cuando se presenta sal o agua salada.
EQUIPO DE ENSAYO—Para el análisis y el gobierno del lodo de perforación.
SERVICIO BAROID DE INFORMES DE POZO—Información sobre formaciones, mediante análisis del lodo.

BAROID SALES DEPARTMENT

NATIONAL PIGMENTS & CHEMICAL DIVISION OF
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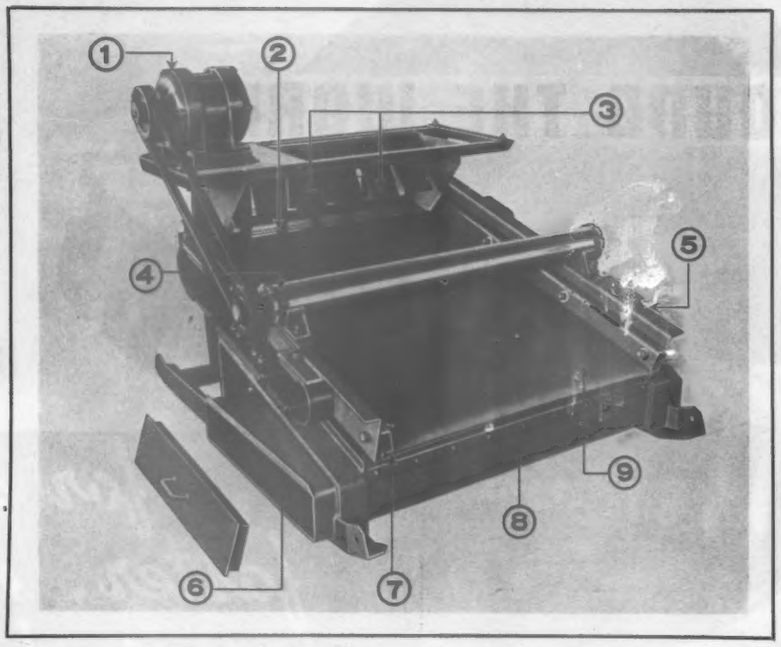
Here It Is—
The NEW LINK-BELT MUD SCREEN

✓

Check These
FEATURES
FOR
EFFICIENT ROTARY MUD CONDITIONING



● Drillers everywhere know from long experience, that the Link-Belt screen offers the most efficient, dependable and economical method of reconditioning rotary mud. That's why you'll find Link-Belt screens on a majority of today's drilling jobs.

Their many exclusive features, some of which follow, have definitely demonstrated advantages such as lower cost operation, better conditioning of mud and longer life:

1. Motor or steam turbine; steam, Diesel or gasoline engine may be used.
2. Perforated bottom plate protects screen cloth against abrasive wear and utilizes entire screening area.
3. Adjustable swinging gates assure good distribution, control flow and provide means for shutting off flow completely.
4. Fully enclosed vibrator unit.
5. Screen box vibrates, producing uniform vibration over entire area of cloth.
6. Screened mud outlet or trough connection; either or both sides.
7. Simple tension-means keeps cloth taut.
8. Unitized mud tank skidded and complete with motor supports and inlet chute.
9. Stainless steel screen cloth cushioned on hollow neoprene.

Made in two sizes—48″x 60″ and 24″x 48″ screening areas, for shallow, medium and deep well drilling. The small size unit has handled the discharge from a pump as large as 7¾″x 20″ under normal conditions.

Aquí está—
El NUEVO COLADOR DE LODO LINK-BELT

✓

Estudie estos
RASGOS
para el
EFICAZ ACONDICIONAMIENTO DEL LODO DE ROTATIVA

● Los perforadores de pozo, en todas partes, saben por larga experiencia, que el colador Link-Belt representa el más eficaz, seguro y económico método de acondicionamiento del lodo de rotativa. Es por esto que los coladores Link-Belt se usan en la mayor parte de los trabajos de perforación de hoy día.

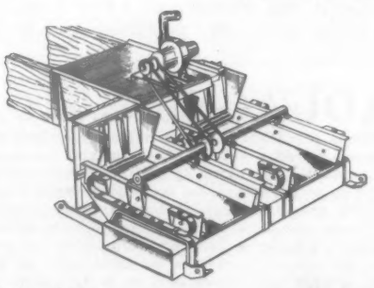
Sus muchos rasgos exclusivos, algunos de los cuales se describen a continuación, han confirmado definitivamente ventajas como menor costo de explotación, mejor acondicionamiento del lodo y más larga duración efectiva:

1. Se puede usar motor o turbina de vapor; máquina de vapor, motor diésel de petróleo o motor de gasolina.
2. La placa perforada del fondo protege la tela del colador contra el desgaste por rozamiento y utiliza la completa superficie coladora.
3. Las compuertas oscilantes ajustables aseguran buena distribución, corriente gobernada y proveen el medio de cerrar por completo la corriente.
4. Vibrador completamente tapado.
5. La caja del colador vibra, produciendo vibración uniforme sobre toda la superficie de la tela.
6. Salida o conexión de bandeja de lodo colado; en cualquiera de ambos lados.
7. Tensión sencilla, para mantener estirada la tela.
8. Tanque de lodo, en grupo, sobre patines y completo con soportes de motor y canal de entrada o admisión.
9. Malla o tela de acero inoxidable, amortiguada en neopreno hueco.

Se ofrece en dos tamaños—de 48″x60″ y de 24″x″48 de superficie coladora, para perforación de pozo a poca profundidad, a profundida regular y a gran profundidad. El tamaño pequeño ha manejado la descarga de una bomba grande de 7¾″x20″, bajo condiciones normales.

DUAL HOOK-UP OF SMALL-SIZE SCREENS

With the arrangement illustrated here, the two screen panels are vibrated independently of each other although having a common inlet chute and collecting tank for both screens. Either screen can be thrown out of service by closing the inlet gates. If the volume of mud is small enough for one screen to handle, a saving can be made by cutting the other screen out of service. In addition to providing a standby unit for emergency service, such an arrangement will give greater capacity than a single screen of double the width, although overall dimensions are not much greater and the headroom required is less. A single 2-HP standard motor will drive both screens on this dual hook-up. Other advantages are greater life for the unit and the ability to use a finer mesh screen cloth with less likelihood of breakage. Let us send you further information.



COMBINACION DOBLE DE COLADORES PEQUENOS

Con la disposición, aquí ilustrada, dos paneles coladores se vibran independientemente el uno del otro, a pesar de que ambos coladores tienen una admisión y un tanque colector en común. Cualquiera de los coladores puede paralizarse sencillamente cerrando las compuertas de entrada. Cuando la cantidad de lodo por manejarse es bastante pequeña para ser manejada por un colador solo, habrá considerable economía suspendiendo el trabajo del otro colador. Además de proveer un equipo auxiliar, para caso de emergencia, semejante disposición asegura una mayor capacidad que un solo colador dos veces más ancho, a pesar de que las dimensiones totales no son más grandes y requiere menos altura. Un solo motor de 2 cdf. de tipo corriente puede accionar ambos coladores en esta combinación doble. Otras ventajas son; mayor duración efectiva para todo el grupo y la facultad de poder usar una malla coladora más fina, con menos peligro de que se rompa. Pídanos información detallada.

LINK-BELT COMPANY

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EXPORT OFFICE: 2680 Woolworth Bldg., New York, N. Y. Cable and Radio Address: "LINKBELT" 7920

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LINK-BELT *Vibrating* SCREEN

THERMAL CRACKING

The oldest and most widely used method of producing relatively high-octane-number gasoline is thermal cracking. A skimming plant finds it difficult to exist for any length of time if competing against plants employing cracking. In order to meet demands by the modern automobile, a considerable quantity of cracked material must be blended into the final fuel. As antiknock requirements of automobile motors continue to increase, more intensive cracking and reforming of low-octane-number naphthas will be the order of the day.

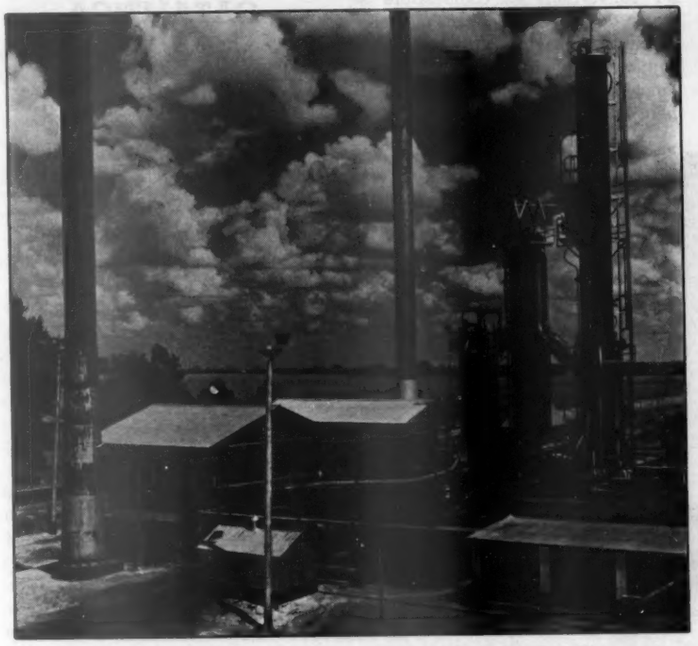
New refineries being built, or major modernization programs currently projected, almost invariably call for the erection of combination units because of the decreased operating expense and better recovery. The building of separate thermal cracking units has been somewhat neglected because of this. However, a great deal of work is being done in this field, looking toward units capable of increased yields operating at reduced expense and producing higher-octane fuels.

Probably the greatest progress in this connection has been in the modernization of old units. Single coils are being changed to two-coil selective type, better furnaces installed, and greater flexibility provided.

The latest change is toward coking operations of the continuous type. Coke chambers are provided within the unit itself or, where several units are operating, a separate set of chambers can be installed to handle the combined heavy cracked fuel-oil yield. A typical installation recently made was of the integral type, wherein two coking chambers are placed between the reaction chamber and the flash tower.

Liquid and vapors from the reaction chamber pass to the coking chambers alternately, one filling while the other is being cleaned. Production is regulated to fill one chamber each day so that a regular daily cleanout schedule is maintained. As many as 60 or 70 chambers of coke have been made on a run.

In the future, when new cracking units are considered as additions or replacements, the thermal type will be forced to compete with the newer catalytic type. Units of both classes are under construction now; however, the future will undoubtedly see the use of one type and fall of the other, at least for production of certain classes of fuels.



Two-coil selective Dubbs cracking unit in a Mid-Continent refinery

Instalación de "cracking" de tipo selectivo, de dos alambiques, en una refinería en la parte central del continente

CATALYTIC CRACKING

The method of producing high-octane-number gasoline by catalytic cracking is one of the most interesting developments of recent times. There are several commercial processes using activated clays, either synthetic or natural, as catalysts. Reaction temperatures range from 800° to 1000° F. with pressures from atmospheric to 200 lb. per sq. in. The raw materials charged are generally in the gas oil and reduced crude cuts. The gasoline produced will have an octane number of 78 to 82.

The Houdry process is of particular interest because of its newness and the fact that some 15 units are either completed, under construction, or planned. The details and results of operation have been made

misma unidad, y cuando hay varias unidades en servicio, se instala una serie separada de cámaras para el manejo del rendimiento combinado de petróleo combustible denso. Una instalación típica, de reciente construcción, es de estilo integral, en el cual dos hornos o cámaras de coquificación quedan colocadas entre la cámara de reacción y la torre de expansión.

El líquido y los vapores de la cámara de reacción pasan a las cámaras de coquificación, alternadamente, llenándose la úna, mientras se está limpiando la otra. La producción está regulada sobre la base de llenar una cámara y de limpiar la otra todos los días. Sobre esta base se manejan hasta 60 y 70 cámaras de coquificación, en operación contínua.

En el futuro, cuando nuevas unidades de "cracking" se consideren como adiciones o repuestos, el tipo termal se verá obligado a competir con el tipo catalítico de más reciente introducción. Se están ahora construyendo unidades de amas clases. Sin embargo, el futuro presenciará indudablemente la subido de un tipo y la bajada del otro, por lo menos, en lo tocante a la producción de ciertas clases de combustibles.

"CRACKING" CATALITICO

El método de producir gasolina de alto número octano por el procedimiento de "cracking" catalítico, es uno de los desarrollos más interesantes de estos últimos tiempos. Hay varios procedimientos comerciales que se valen de arcillas actividades, sintéticas o naturales, como catalizadores. Las temperaturas de reacción varían de 800 a 1000 grados Fahrenheit, con presiones atmosféricas que llegan hasta 200 libras por pulgada cuadrada. Los materiales crudos cargados están generalmente en el gas oil o aceite de gas y los crudos reducidos. La gasolina producida tiene número de octano de 78 a 82.

El procedimiento Houdry es de particular interes debido no sólo a su novedad, sino también al hecho de que están ya terminadas, o bajo construcción, o en proyecto, como 15 de estas instalaciónes. Los detalles y los resultados de su funcionamiento se han conseguido sólo estos últimos meses.

El movimiento típico es el siguiente: El material de carga pasa por cambiadores de temperatura, a un calentador, y de aquí, a un separador de alquitrán de tipo especial. El alquitrán separado es quitado continuamente y pasado por bomba a un depósito. El vapor resultante de esta torre pasa a una de las tres cajas o cámaras catalíticas del sistema. Estas cajas o cámaras tienen acción alternada, pues mientras una está recibiendo los vapores, las otras dos se encuentran en variables grados de regeneración. El material proveniente de la caja va a una torre fraccionadora, donde el gas y la gasolina salen por arriba y una o más fracciones de gas oil o aceite de gas se escapan por abajo. El gas puede someterse a adicional polimerización o tratarse, si se desea, para que rinda gasolina de alto número octano.

El catalizador es regenerado por la quemadura de los depósitos de carbón con la ayuda de aire precalentado. Los gases de combustión de la caja, después de regenerados, pasan a otra caja donde se queman de nuevo para quitarles el monóxido de carbono y el vapor de aceite. El calor de la regeneración es absorbido por una corriente de sal derretida.

Las ventajas económicas de semejante instalación son materia de estudio particular. Las unidades pueden hacerse bastante flexibles, tanto en lo tocante a cargas, como en lo relativo a la calidad de los productos hechos. Pueden hacerse mayores cantidades de productos intermediarios y menos de los densos y baratos. Los números de octano de las gasolinas son más altos que los producidos por el procedimiento termal. Sin embargo, los costos de inversión son más subidos de modo que el refinador tiene que enfrentar el problema de pesar los méritos respectivos de los varios procedimientos.

Casi todas las instalaciones de destilación por el procedimiento de "cracking" catalítico, construídas hasta ahora, son del tipo intermitente. Esto quiere decir que las cajas o cámaras funcionan separadamente, en ciclos y el catalizador se regenera en el mismo punto. Actualmente una de estas instalaciones está funcionando en procedimiento contínuo, en el cual la carga, en estado de vapor, y el catalizador, se juntan y luego se separan. Se quita el catalizador y se regenera afuera, mientras el catalizador fresco entra continuamente en la zona de reacción. Este tipo de construcción parece ser más económico, y si efectivamente es así, tendrá entonces un gran ventaja sobre el otro tipo.

Talvez, de mayor interes todavía, especialmente para los refinadores en menor escala, es la posibilidad de aumentar el número octano mediante reformación catalítica. La suplantación de una instalación de "cracking" termal por una de "cracking" catalítica, significa ganar de 8 a 10 numeros de octano en beneficio de la producción de gasolina. La reformación catalítica o deshidrogenación, como se llama también, a veces. puede efectuar un aumento de 20 o más números de octano, en una gran porción de la producción total de gasolina.

Se dice que se ha desarrollado ya un nuevo método de reformación catalítica de un paso, que puede producir gasolina de número octano 90, pero con un menor rendimiento o producción. El nuevo método se adapta a instalaciones más pequeñas que las típicas de "cracking" catalítico, y por esta razón, es de particular interes para los dueños de refinerías o

available only in the past few months.

A typical flow is as follows: The charging stock passes through heat exchangers to the heater and from there to a tar separator of special design. The separated tar is removed continuously and pumped to storage. The overhead from this tower passes to one of three catalytic cases. These cases are operated alternately, one receiving vapors while the other two are in varying stages of regeneration. The material coming from the case goes to a fractionating column where gas and gasoline come off overhead and one or more cuts of gas oil are removed from the lower part. The gas can be further polymerized or treated for high-octane gasoline production if desired.

The catalyst is regenerated by burning off the carbon deposits with the aid of preheated air. The flue gases from the case being regenerated, pass to another case and are further burned to eliminate carbon monoxide and oil vapor. The heat of regeneration is absorbed by circulating molten salt.

The economics of such an installation are a matter of individual study. The units can be made quite flexible, both as to charge and as to quality of products made. Greater quantities of intermediate products can be made and less of the heavy, low-price ones. The octane numbers of the gasolines are higher than those produced by thermal processes. However, investment costs are higher so that the refiner is faced with a problem in weighing the respective merits of various processes.

Most of the catalytic cracking plants built to date are of the intermittent type. That is, the cases are operated separately, in cycles, and the catalyst is regenerated in place. One unit is now being operated as a continuous process where the charge in the vapor state and catalyst are brought together and then separated. The catalyst is removed and regenerated outside while fresh catalyst enters the reaction zone continuously. Such construction is reported to be cheaper and, if so, will possibly have an advantage over the other type.

Perhaps of greater interest, especially to the smaller refiner, is the possibility for greater octane-number improvement through catalytic reforming. To supplant thermal cracking with catalytic cracking means a gain of some 8 or 10 octane numbers on part of the plant's gasoline production. Catalytic reforming or dehydrogenation, as it is sometimes called, can make an increase of 20 or more numbers on a large portion of the total gasoline production.

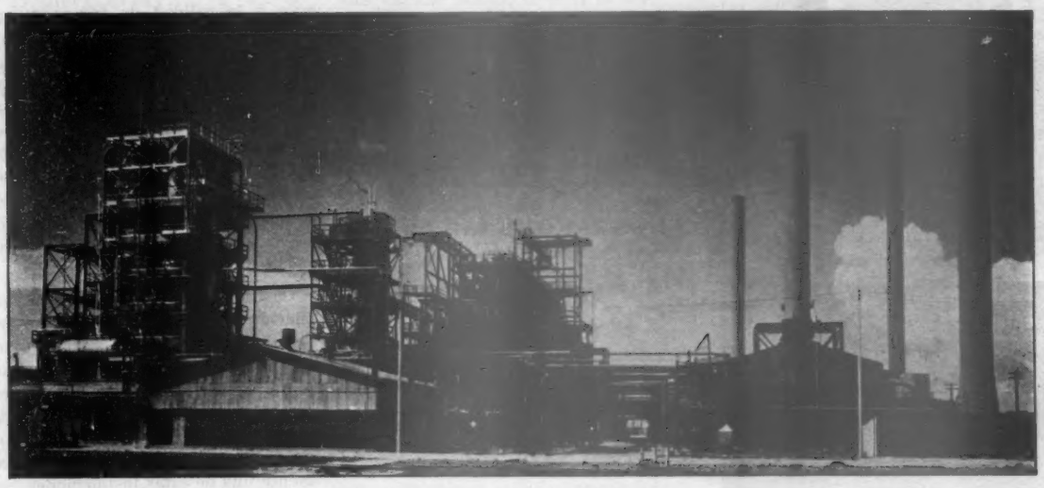
It is reported that a new method of one-pass catalytic reforming has been developed, which will produce gasoline with a 90-octane number, but with a lower yield. The operation is adaptable to smaller units than is the case with catalytic cracking units, and so is of particular interest to the operator of the smaller refinery. The combination of polymerization, catalytic reforming, and thermal cracking already available, would produce high-octane-number motor fuel to meet demand.

THERMAL POLYMERIZATION

A number of new plants operating under various patents have recently been completed. Light hydrocarbons, consisting of butane and lighter, produced in the refinery may, under proper operating conditions, be converted into premium motor fuel. Thermal polymerization processes operate with reaction temperatures in the neighborhood of 1000° F. and with pressures ranging from 600 to 3,000 lb. per sq. in. Raw charge is propane, propene, butane-butene, and gasoline of around 80-octane number is produced.

The flow in one process sees fresh

(Continued on Page 284)



Atlantic Refining Co. plant near Beaumont, Tex., one of largest additions to the Gulf Coast refinery capacity in recent years

Instalación de la Atlantic Refining Co., cerca de Beaumont, Texas, una de las adiciones más grandes a la capacidad refinadora del Golfo de la Costa hecha en años recientes

destilerías menores. La combinación de polimerización, reformación catalítica y "cracking" termal, disponible actualmente, puede producir combustible de motor de alto número octano, para satisfacer la demanda.

POLIMERIZACION TERMAL

Recientemente se han construido varias instalaciones que funcionan diversas patentes. Los hidrocarburos volátiles, como el butano y otros, producidos en la refinería, pueden ser convertidos en combustible de motor de superior calidad, mediante adecuado procedimiento. Los procedimientos de polimerización termal funcionan con temperaturas de reacción de casi 1000 grados Fahrenheit y con presiones de 600 a 3000 libras por pulgada cuadrada. La carga de materiales crudos está representada por propano, propeno, butano y buteno, y la gasolina producida es casi de número octano 80.

En el procedimiento el material fresco alimentado pasa a una fraccionadora donde se quitan el hidrógeno, el metano y el etano. La carga acondicionada entra al serptentín de polimerización, donde se lleva a efecto la conversión. Los productos de la reacción van a una torre fraccionadora, donde el gas es separado para adicional tratamiento y reducción. La gasolina polimérica va a una segunda torre fraccionadora donde se quita la gasolina por arriba y se saca por abajo una pequeña cantidad de gas oil o aceite de gas.

Se ha perfeccionado también otro procedimiento que tiene gran flexibilidad o adaptación en lo tocante a varias importantes fases de la polimerización termal. Retiene todos los butanos y butenes y fracciones densas, que son valiosas como material de carga, desde el punto de vista del rendimiento, y hace provisión para la reducción adicional del grupo etano etileno, el cual decrece la concentración de insaturables en la carga fresca y produce un destilado polimérico de vapor de baja presión.

Las instalaciones de polimerización termal son también adaptables al propano y butano producidos de gas natural. Esta fuente de material crudo, en adición a la producida de las operaciones de refinería, representa una enorme cantidad de material, que puede ser transformado en combustible de motor de valor comercial, con la ayuda del presente procedimiento.

POLIMERIZACION CATALITICA

Este tipo de procedimiento utiliza propenos y butenos, como material de carga, y produce gasolina de número octano 80 a 85. El ácido fosfórico y el ácido sulfúrico son los catalizadores que se emplean, por lo menos, en dos procedimientos. Las temperaturas y presiones de reacción son generalmente bajas, en comparación con las de la polimerización termal.

Una importante compañía está produciendo isooctano de isobutileno, valiéndose de dos métodos. El primer método emplea ácido sulfúrico frío, como catalizador. La carga se mezcla con ácido de 60 a 70%, a una temperatura de 20 a 35 centígrados y se pone en contacto de contracorriente en dos etapas. El isobutileno es selectivamente absorbido en la etapa o fase del ácido, dependiente el procentaje así absorbido, de la fuerza del ácido y temperatura. Cuando la fase ácido queda saturada de isobutileno, es separada y pasada por un serpentín de polimerización separado. Después de un minuto, a una temperatura de 100° C., el butileno se polimeriza en isoocteno, el cual, después de la hidrogenación, queda convertido en isooctano.

El segundo método se llama procedimiento de ácido caliente, a causa de que la polimerización se efectúa a más de 60° C. Cuando se aumenta la temperatura de la reacción de absorción, el isobutileno absorbido en la fase ácida se condensa en forma polimérica y es de nuevo absorbido en la fase de hidrocarburo. A las temperaturas más altas, la reacción es bastante rápida, de modo que el isobutileno absorbido tiene sólo una breve duración en la fase ácida. El efecto final es forzar la reacción de absorción a terminación, manteniendo la fase ácida en un estado debilitado, para recuperar así todo el isobutileno presente. Con el procedimiento de ácido caliente se obtienen, por lo tanto, mayores rendimientos que con el procedimiento de ácido frío.

El procedimiento Plyco de polimerización catalítica acciona sobre los insaturados, principalmente sobre los propilenos y butilenos presentes en la alimentación. La alimentación o carga líquida recibe lavado cáustico, se calienta y se pasa por capa catalizadora. Se proveen

(Continue en Pagina 284)

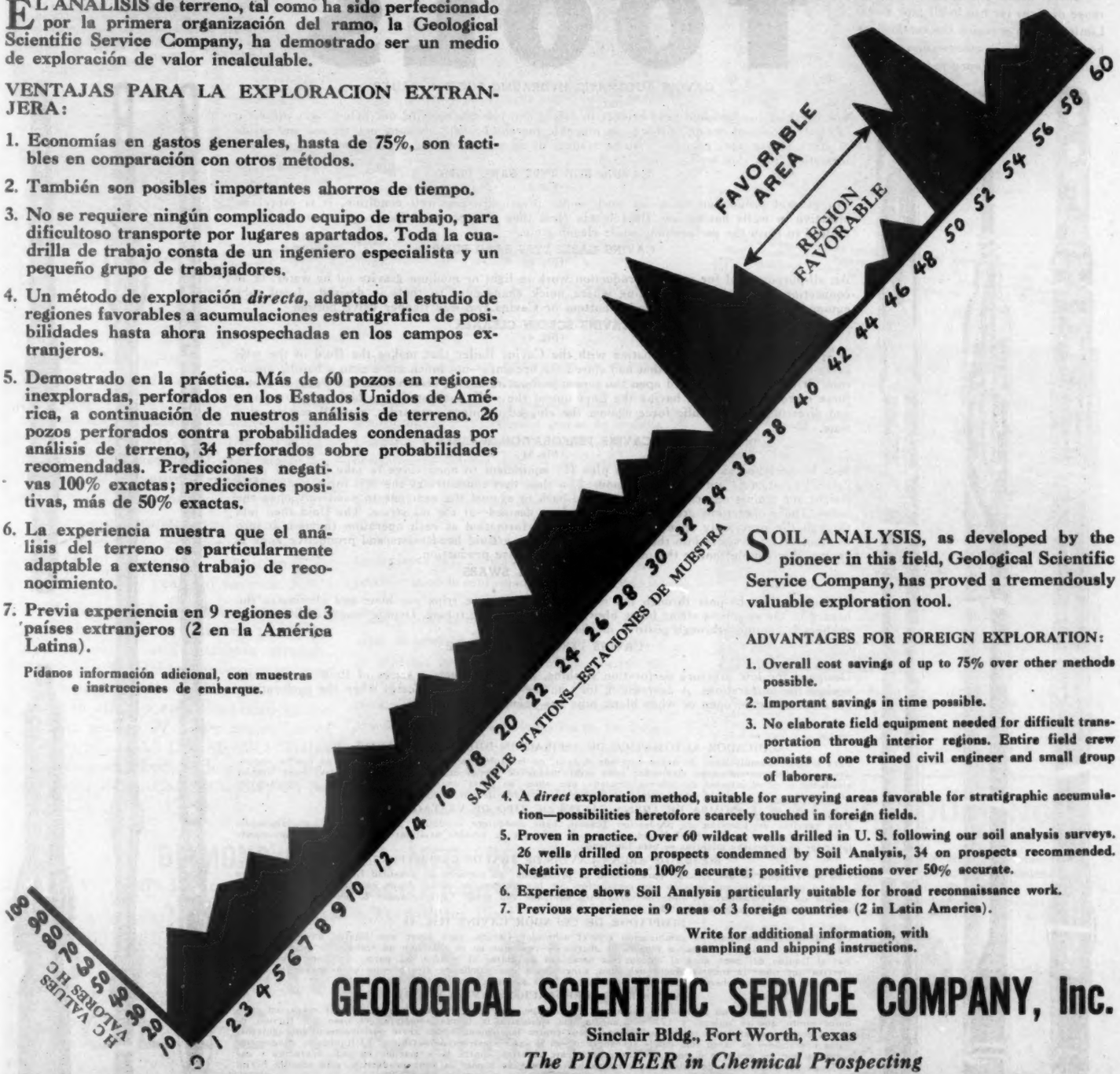
ANALISIS DE TERRENO PARA EXPLORACION EXTRANJERA

EL ANALISIS de terreno, tal como ha sido perfeccionado por la primera organización del ramo, la Geological Scientific Service Company, ha demostrado ser un medio de exploración de valor incalculable.

VENTAJAS PARA LA EXPLORACION EXTRANJERA:

1. Economías en gastos generales, hasta de 75%, son factibles en comparación con otros métodos.
2. También son posibles importantes ahorros de tiempo.
3. No se requiere ningún complicado equipo de trabajo, para dificultoso transporte por lugares apartados. Toda la cuadrilla de trabajo consta de un ingeniero especialista y un pequeño grupo de trabajadores.
4. Un método de exploración *directa*, adaptado al estudio de regiones favorables a acumulaciones estratigrafica de posibilidades hasta ahora insospechadas en los campos extranjeros.
5. Demostrado en la práctica. Más de 60 pozos en regiones inexploradas, perforados en los Estados Unidos de América, a continuación de nuestros análisis de terreno. 26 pozos perforados contra probabilidades condenadas por análisis de terreno, 34 perforados sobre probabilidades recomendadas. Predicciones negativas 100% exactas; predicciones positivas, más de 50% exactas.
6. La experiencia muestra que el análisis del terreno es particularmente adaptable a extenso trabajo de reconocimiento.
7. Previa experiencia en 9 regiones de 3 países extranjeros (2 en la América Latina).

Pídanos información adicional, con muestras e instrucciones de embarque.



SOIL ANALYSIS, as developed by the pioneer in this field, Geological Scientific Service Company, has proved a tremendously valuable exploration tool.

ADVANTAGES FOR FOREIGN EXPLORATION:

1. Overall cost savings of up to 75% over other methods possible.
2. Important savings in time possible.
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5. Proven in practice. Over 60 wildcat wells drilled in U. S. following our soil analysis surveys. 26 wells drilled on prospects condemned by Soil Analysis, 34 on prospects recommended. Negative predictions 100% accurate; positive predictions over 50% accurate.
6. Experience shows Soil Analysis particularly suitable for broad reconnaissance work.
7. Previous experience in 9 areas of 3 foreign countries (2 in Latin America).

Write for additional information, with sampling and shipping instructions.

GEOLOGICAL SCIENTIFIC SERVICE COMPANY, Inc.

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The PIONEER in Chemical Prospecting

SOIL ANALYSIS FOR FOREIGN EXPLORATION

CAVINS "Performance-Plus" TOOLS

"Cavins tools are made in a wide range of sizes for use in all pipe sizes. Limited space prevents the cataloguing herein of detailed specifications which will be gladly sent upon request."

"Las harramientas Cavins se hacen en una vasta escala de tamaños, para uso en tubería de todo tamaño. Por falta de espacio no podemos dar información detallada sobre todas ellas, pero ésta la daremos gustosamente a quien se sirva pedírnosla."

Fig. 1

Fig. 2

Fig. 3

CAVINS AUTOMATIC HYDRAULIC SUCTION BAILER
(Fig. 1)

For breaking hard packed sand bridges in casing and tubing; cleaning out below tight places in partially collapsed casing; fishing out movable pieces of junk; cleaning out around and inside of stuck tubing, etc., prior to running a spear or socket; removing gravel tamp and shattered formation from shot wells.

CAVINS ROD TYPE SAND PUMP
(Fig. 2)

For general production clean-out work under practically any well condition, it is especially effective in wells having low fluid levels (less than 500' of static head), or where it is not desired to flush the perforations while cleaning out.

CAVINS CABLE TYPE SAND PUMP
(Fig. 3)

An all-purpose tool for straight production work in light or medium gravity oil or water, or in connection with cable tool drilling where quick changeover to tools is desired. Load tube equipped with either Cavins-Candee bottom or Cavins two-way flapper valve bottom.

CAVINS SCREEN CLEANER
(Fig. 4)

A special attachment in combination with the Cavins Bailer that makes the fluid in the well drive back the mud and sand that had closed the openings—not much more than a bailing operation. It makes the well fluid open the screen without removing screen from the well. It uses a force more effective than having the liner out of the well, connected to a high pressure pump and directing the hydraulic force against the clogged openings outwardly, a small section at a time.

CAVINS PERFORATION WASHER
(Fig. 5)

May be analyzed as a Cavins Bailer plus (1) equipment to open valve to take load any place desired by starting out of the well, and (2) a shoe that concentrates the full force of the fluid weight out against one clogged opening and back in against the next one to positively open the holes. These operations are directed only where desired—at the oil strata. The fluid then jets through the previously opened holes against the formation at each operation to wash it into the tool or let it settle into the well bottom. Where a fluid head exists and productive zone is known, this simple tool is the quickest way to increase production.

CAVINS TUBING SWABS
(Fig. 6)

Maximum fluid by-pass through the mandrel assures more trips per hour and eliminates the hazard of the swabbing string being blown up or out of the tubing. Double length of life of our rubbers is common through positive mechanical expansion.

CAVINS PERFORATION SWAB
(Fig. 7)

Designed for low pressure perforation washing, this tool directs a series of fluid jets directly against the perforations. A decrease in load on the pulling unit indicates when the perforations have been flushed open or when blank pipe has been reached.

Fig. 4

Fig. 5

Fig. 6

Fig. 7

ACHICADOR AUTOMATICO DE ASPIRACION HIDRAULICA CAVINS (Fig. 1)

Para romper acumulaciones de arena apretada y dura, en las tuberías; para limpiar debajo de puntos apretados en tubería parcialmente dislocada; para sacar piezas de hierro que puedan ser pescadas; para limpiar alrededor y en el interior de tubería atrapada, etc. antes de pasar un arpón de circulación o manguito de salvamento; para quitar la grava dura y la formación triturada de pozos dinamitados.

BOMBA DE ARENA CAVINS DE TIPO DE VASTAGO (Fig. 2)

Para servicio de limpieza de producción general, bajo cualquiera condición de pozo. Es particularmente efectiva en pozos de bajo nivel líquido (menos de 500 pies de presión estática) o donde no es conveniente lavar las perforaciones mientras se está limpiando.

BOMBA DE ARENA CAVINS DE TIPO DE CABLE (Fig. 3)

Una herramienta de uso general, para trabajo de producción, en petróleo de densidad liviana o regular, y en agua, o para trabajo en conexión con perforación con herramienta de cable, donde es conveniente un rápido cambio de herramientas. El tubo de carga está equipado con fondo Cavins-Candee o con fondo Cavins de válvula de chapaleta de dos sentidos.

LIMPIADOR DE COLADOR CAVINS (Fig. 4)

Un aditamiento especial, en combinación con el achicador Cavins, para hacer que líquido en el pozo desaloje el lodo y arena que hayan tapado las aberturas—cosa que no es más que un trabajo de achicar. Hace que el líquido del pozo abra el colador sin necesidad de quitar el colador del pozo. Usa una fuerza más efectiva que sacar la tubería afuera del pozo, conectado a una bomba de alta presión y dirigiendo la fuerza hidráulica contra las aberturas tapadas, hacia afuera, una pequeña sección cada vez.

LAVADOR DE PERFORACION CAVINS (Fig. 5)

Puede decirse que es un achicador Cavins más (1) equipo para abrir la válvula para admitir carga, en cualquier punto que se quiera, y (2) una zapata que concentra la fuerza completa del peso del líquido de afuera contra una abertura tapada y lo lanza luego contra la siguiente, para abrir positivamente los agujeros. Estas operaciones se hacen sólo donde se necesitan—en la capa o estrata de petróleo. El líquido se desparrama entonces por los agujeros o perforaciones previamente abiertas, contra la formación, en cada operación y cae al fondo del pozo. Cuando existe una columna hidráulica y se conoce la zona productiva, esta sencilla herramienta es el método más seguro para aumentar la producción.

LIMPIATUBOS CAVINS (Fig. 6)

El máximo paso en derivación del líquido por el mandril asegura más viajes por hora y suprime el peligro de que el equipo de limpieza sea expelido de la tubería. Las piezas de caucho tienen doble duración debido a su positiva extensión mecánica.

LIMPIADOR DE PERFORACION CAVINS (Fig. 7)

Proyectado para limpieza de perforaciones de baja presión, esta herramienta dirige una serie de chorros de líquido directamente contra las perforaciones. Una reducción en carga en el mecanismo empujador indica cuando las perforaciones se han abierto por el lavado o cuando el tubo liso ha sido alcanzado.

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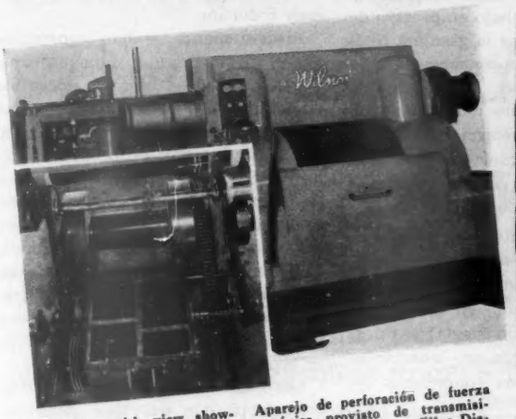
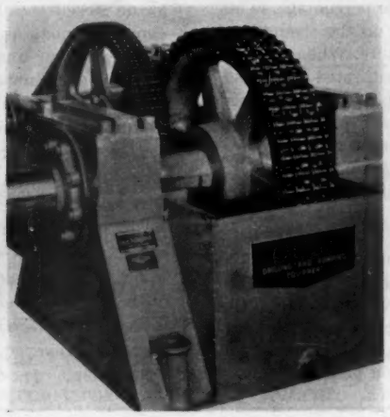


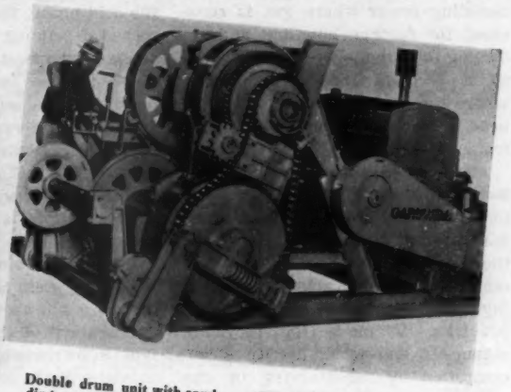
Power Rig with view showing the Diamond Roller Chain Drives.

Aparejo de perforación de fuerza mecánica provisto de transmisiones por cadenas de rodillos Diamond.



Diamond Roller Chain Drives in speed reducer for pumping machine.

Transmisiones por cadenas de rodillos Diamond en una reductora de velocidad de máquina de bombar.



Double drum unit with spudding attachment equipped with Diamond Roller Chain Drives.

Tambor doble grupo con aditamiento de perforación inicial, equipado con transmisiones por cadenas de rodillos Diamond.

Since the earliest application of modern methods in the oil fields, Diamond Roller Chain Drives have proved their unusual reserve power and dependability. In the drilling, pumping and servicing rigs made by the world's leading manufacturers, Diamond Chains are used regularly.

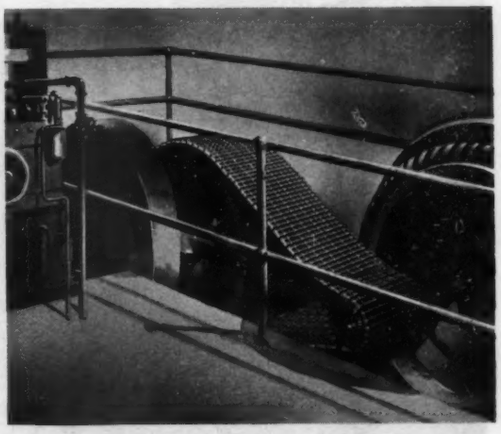
They are compact, and sturdy, and retain their high efficiency under severe field operating conditions, as proven by long years of service.

Diamond Roller Chains are made in pitch sizes from ⅜ in. up to 2½ in. and in single and multiple strands. They are available for every power drive application—and are carried in stock in all important locations in the U.S.A. and in 27 other countries of the world . . . All DIAMOND Chains are trade-marked with a "diamond" on every link. Catalog mailed on request.

Desde las primeras aplicaciones de métodos modernos a los campos petrolíferos, las transmisiones por cadenas de rodillos Diamond han demostrado su extraordinaria fuerza de reserva y seguridad. Las cadenas Diamond se emplean normalmente en los equipos de perforación, grupos de bombas y aparejos de servicio, producidos por los principales fabricantes del mundo.

Son compactas y firmes. Retienen su gran rendimiento bajo las más severas condiciones de servicio, como lo confirman muchos años trabajo.

Las cadenas de rodillos Diamond se ofrecen con pasos de tamaños corrientes, de ⅜" hasta 2½", en modelos de una y de múltiple corrida de rodillos. Se ofrecen para toda aplicación de transmisión de fuerza—y están en depósito en los principales centros de la industria en los Estados Unidos de América y en 23 otros países del mundo . . . Todas las cadenas DIAMOND llevan, como marca de identificación, el bombre "Diamond" en cada eslabón. Catálogo a solicitud.



A 12-strand Diamond Roller Chain Drive, runs at 1520 ft. per minute from 500 H.P. diesel engine to electric generator in pipe line station.

Transmisión por cadena de rodillos Diamond de 12 hileras, que funciona a 1520 piés por minuto, entre un motor diésel de 500 cdf. y un generador eléctrico, en una estación de líneas de tubería.

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The original all-steel chain type flexible couplings—easy to connect and disconnect. Made in sizes up to 11 inch.

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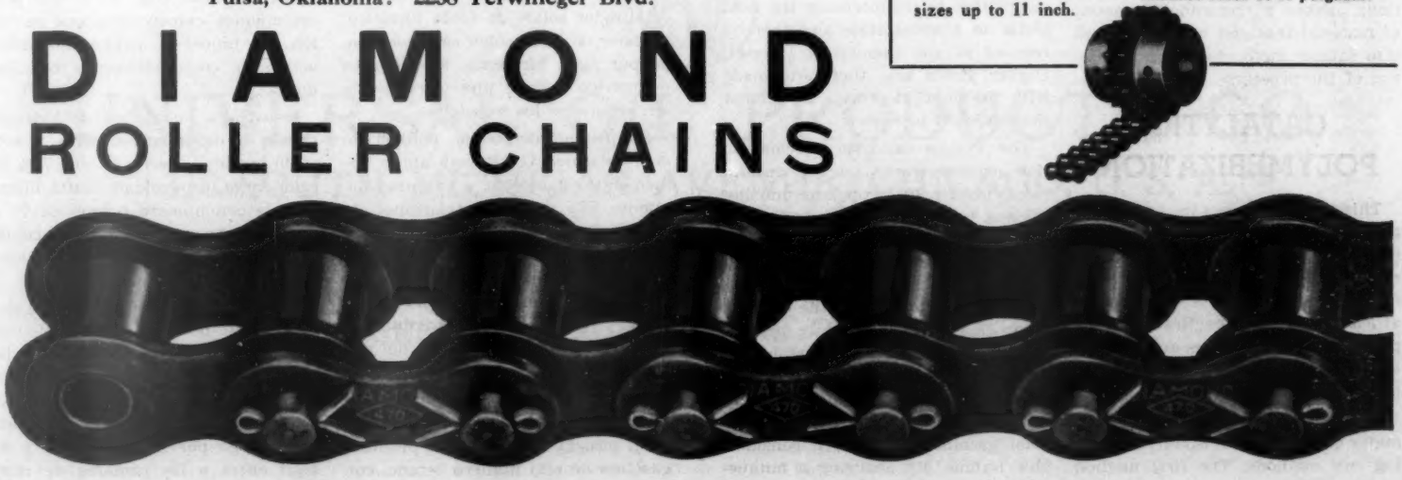
DIAMOND ROLLER CHAINS



feed going to a fractionator where the hydrogen, methane, and ethane are eliminated. The conditioned charge enters the polymerization coil where conversion takes place. The products of the reaction go to a fractionating tower where gas is separated for further handling and recycling. The polymer gasoline goes to a second fractionating tower where the gasoline is removed overhead and a small quantity of gas oil from the bottom.

Another process is reported tc have great flexibility with respect to several important phases of thermal polymerization. It retains all the butanes and butenes and heavy recycle which are valuable as charging stock from a yield standpoint, provision is made for recycling ethane-ethylene which decreases concentration of unsaturates in the fresh feed, and it produces a low vapor pressure polymer distillate.

Thermal polymerization plants are adaptable as well to propane and butane produced from natural gas. This source of raw supply, coupled with that produced from refinery operations, makes a tremendous amount of material that can be transformed into salable motor fuel through the use of the process.

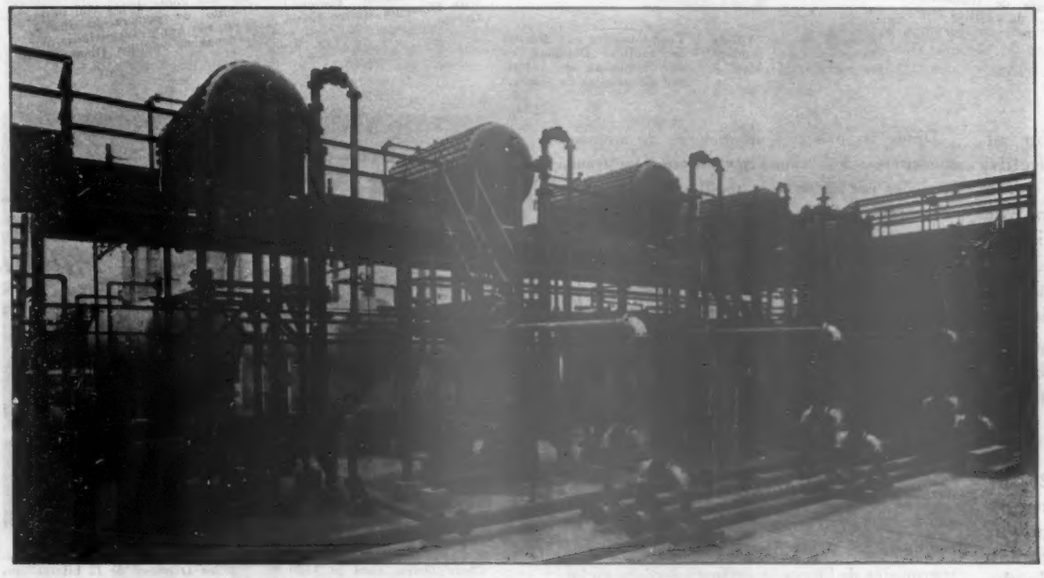
CATALYTIC POLYMERIZATION

This type of process uses propenes and butenes as charging stock, and produces gasoline of 80 to 85-octane number. Phosphoric acid and sulfuric acid are catalysts employed in at least two processes. Reaction temperatures and pressures are generally low as compared with thermal polymerization processes.

Isooctane is being produced by one major company from isobutylene, using two methods. The first method employs cold sulfuric acid as a catalyst. The charge is mixed with 60 to 70 per cent acid at a temperature of 20° to 35° C. and contacted countercurrently in two stages. The isobutylene is selectively absorbed into the acid phase, the percentage so absorbed depending on the strength of acid and temperature. When the acid phase becomes saturated with isobutylene, it is separated and passed through a separate polymerization coil. After 1 minute at a temperature of 100° C., butylene is polymerized to isooctene, which after hydrogenation, is changed into isooctane.

The second method is called the hot-acid process as polymerization is carried out at above 60° C. When the temperature of the absorption reaction is increased, the absorbed isobutylene in the acid phase condenses to polymer, and this is reabsorbed into the hydrocarbon phase. At the higher temperatures, the reaction is sufficiently rapid so that the absorbed isobutylene has a short life in the acid phase. The net effect is to force the absorption reaction to completion by maintaining the acid phase in a spent state and thereby recover all the isobutylene present. Higher yields are, therefore, made with the hot-acid process as against the cold-acid process.

The Polyco catalytic polymerization process works on the unsaturates, principally propylene and butylenes, present in the feed. The liquid feed is caustic washed, heated, and passed through the catalyst bed. Two catalyst beds are provided so one can be in use while the other is being changed. The polymer and unconverted material go to a stabilizer for separation. The polymer produced has a high blending value and is low in vapor pressure so that the final gasoline will absorb considerable butane. By charging a butane-



Part of equipment comprising 25,000-bbl. per day liquid copper sweetening unit in Phillips Petroleum refinery, Borger, Tex.

Parte del equipo comprendido en la instalación destufadora por procedimiento cúprico liquido, de 25.000 barriles por día, de la refinería de la Phillips Petroleum Co. en Borger, Texas

dos capas catalizadoras, para que una esté en uso mientras la ótra se está cambiando. El líquido polimérico y material inconvertido van a un estabilizador, para su separación. El polimérico producido tiene un gran valor de mezcla y es bajo en presión de vapor, de modo que la gasolina final podrá absorber una considerable proporción de butano. Cargando una fracción de butano butileno, bajo condiciones cuidadosamente reguladas, se puede producir un grado técnico de isooctano, en la preparación de gasolina para motores de aviación.

El procedimiento de isooctano U.O.P. polimeriza selectivamente los isobutenos contenidos en una mezcla de butano y buteno, en isooctenos. Estos isooctenos son luego catalíticamente hidrogenados en isooctanos. Dependiendo de las condiciones de funcionamiento, se obtienen números octano de 93 a 97.

La alimentación recibe lavado caustico, se calienta a cerca de 325° F., bajo una presión de 600 a 800 libras por pulgada cuadrada y se pasa por la torre catalizadora, que contiene catalizador sólido de ácido fosfórico. El calor de la reacción está gobernado por agua hirviente. El producto polimérico pasa a una torre donde son separados los isooctenos.

El procedimiento de polimerización catalítica U.O.P. está ahora firmemente establecido y en funcionamiento hay varias instalaciones de capacidades variables. En general, este procedimiento recupera gasolina del gas de escape, reduce los requisidos de plomo en la gasolina terminada y probablemente permite la producción de combustible de mejor calidad.

Seguramente los refinadores, en menor escala, se habrán preguntado, en el pasado, cómo podrían producir gasolina de alto número octano, con sólo una pequeña cantidad de adecuada carga disponible, mediante una inversión moderada. Una respuesta a este problema es la reciente introducción de un equipo de polimerización de tipo catalítico, de tamaño muy reducido.

Recientemente se han construido varias instalaciones que tienen capacidades variables, de unos pocos barriles hasta 200 o más al día, y todas mediante inversiones relativamente bajas. La fracción de propeno buteno es comprimida por un compresor de funcionamiento independiente, calentada a 350-400° F., y pasada por los tubos del catalizador. El producto polimérico se descarga en un estabilizador, conjuntamente con la requerida cantidad de butanos, para dar la deseada presión de vapor, y es separada del gas residual.

Las gasolinas estabilizadas a 10 libras de presión de vapor muestran un número octano de 82 plus. El porcentaje de rendimiento o producción de gasolina es aumentado y el número octano total también es aumentado.

Hay en proyecto instalaciones de isooctano, de capacidades o dimensiones muy reducidas, para producir hasta 50 barriles de isooctano al día. Una fracción de butano buteno, del estabilizador de presión de alambique, se usa como carga. Se emplean presiones relativamente altas y temperaturas bajas. El material producido puede convertirse en isooctanos, mediante hidrogenación de baja presión, en presencia de un catalizador de níquel. Los isooctanos pueden convertirse en gasolina de motor de aviación, mezlándolos con gasolina natural e isopentano para volatilidad y plomo para subirlo a un número octano de 100.

HIDROGENACION CATALITICA

La hidrogenación catalítica fué introducida hace varios años. El procedimiento, sin embargo, ha crecido en importancia, en estos últimos tiempos, a causa de la gran rapidez con que se ha desarrollado la demanda de combustibles con subido número octano. Hay dos o tres procedimientos comerciales, que se valen de níquel u óxidos metálicos activados, como elementos catalizadores.

Una típica instalación de hidrogenación de nafta para motores de aviación puede convertir de 50 a 75% de cada carga, produciendo nafta hidrogenada con número octano de 75 a 78, de buena estabilidad, bajo contenido de azufre y alta susceptibilidad al plomo.

La carga fresca de material de gas oil o aceite de gas de características volátiles se mezcla con el material tratado que regresa de la unidad provisto de hidrógeno. La mezcla es pasada por cambiadores de temperatura, luego por un calentador y de aquí entra a las cámaras de reac-

More and better gasoline

Davantage d'essence—et meilleure

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THE Dubbscracking process produces the maximum yield of the best kind of gasoline from crude oil or any fraction of it—or from tar or shale oil

The U. O. P. catalytic polymerization process goes a step farther It converts gases into a new kind of high octane gasoline—polymer gasoline

The U. O. P. iso-octane process goes still farther It produces a super fuel which gives new speed and range and climbing power to airplanes

U.O.P. processes offer the best means of producing the best of motor fuels for use on land and in the air

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LE procédé de Cracking Dubbs donne le rendement maximum de la meilleure espèce d'essence à partir du pétrole brut ou de ses diverses fractions ou de l'huile de goudron ou de schiste.

Le procédé de polymérisation catalytique U. O. P. va même plus loin. Il convertit les gaz en essence de haut indice d'octane d'une nouvelle espèce —l'essence polymère.

Le procédé de production d'iso-octane U. O. P. va plus loin encore. Il produit un super-combustible qui donne aux aéroplanes une nouvelle vitesse — un nouvel essor — une nouvelle puissance d'ascension.

Les procédés U. O. P. offrent les meilleurs moyens pour produire ce qu'il y a de mieux en combustibles pour moteurs utilisés sur terre et dans l'air.

Pour renseignements complets veuillez vous adresser à:

CON el Procedimiento DUBBS para el fraccionamiento del petróleo ("DUBBSCRACKING") se obtiene la producción máxima de la mejor clase de gasolina del petróleo crudo o de cualquier fracción del mismo — o de aceite de alquitrán o de esquistos.

El procedimiento de polimerización catalítica de la U.O.P. va un poco más lejos. Convierte los gases en una nueva clase de gasolina de alto octano —gasolina polímera.

El procedimiento iso-octano de la U. O. P. va todavía más lejos. Produce un combustible superior, con el cual los aeroplanos adquieren una mayor velocidad y radio de acción y pueden ascender a mayor altura.

Los procedimientos de la U. O. P. producen los mejores combustibles de motores, ya sea que éstos se empleen en tierra o en el aire.

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DR. V. HENNY

REPRESENTATIVE, UNIVERSAL OIL PRODUCTS CO.

BUSH HOUSE, ALDWYCH, LONDON, W.C. 2, ENGLAND

butylene fraction, under carefully controlled conditions, a technical grade of isooctane can be produced in the preparation of aviation gasolines.

The U.O.P. isooctane process selectively polymerizes the normal and isobutenes contained in a butane-butene mixture to isooctenes. These isooctenes are then catalytically hydrogenated to isooctanes. Octane numbers of 93 to 97 are reported, depending on operating conditions.

The feed is caustic washed, heated to about 325° F. under a pressure of 600 to 800 lb. per sq. in., and passed through the catalyst tower containing solid phosphoric acid catalyst. The heat of reaction is controlled by boiling water. The polymer product passes to a tower where the isooctenes are separated.

The U.O.P. catalytic polymerization process is now firmly established and a number of plants of varying sizes are being operated. In general, this facility will recover gasoline from waste gas, reduce lead requirements in finished gasoline, and probably permit producing a higher-quality fuel.

The small refiner has wondered, no doubt, in the past as to how he could produce high-octane gasoline with only a small amount of proper charge available, and at a reasonable investment. One answer to this problem is the recent appearance of the much-publicized midget polymerization unit of the catalytic type.

Several plants have recently been built having capacities from a few barrels to as much as 200 bbl. of gasoline per day, at relatively low costs. The propene-butene fraction is compressed by a separately operated compressor, heated to 350-400° F., and passed through the catalyst tubes. The polymer product is discharged into a stabilizer, together with the required amount of butanes to give the desired vapor pressure, and is separated from the residue gas.

The gasolines stabilized to 10 lb. vapor pressure show an octane number of +82. The gasoline yield percentage is increased and the overall octane number is also raised.

Plans have been drawn for midget isooctane units producing 50 bbl. a day of isooctane. A butane-butene fraction from the pressure-still stabilizer is used as charge. Relatively high pressure and low temperature are employed. The material produced can be converted to isooctanes by low-pressure hydrogenation in the presence of a nickel catalyst. The isooctanes can be converted to aviation gasoline by blending with natural gasoline and isopentane for volatility and leading to 100-octane number.

CATALYTIC HYDROGENATION

Catalytic hydrogenation was introduced some years ago. However, the process has taken an additional significance recently because of the rapidly increasing demands for high-octane number fuels. There are two or three commercial processes which employ activated nickel or metal oxides as catalysts.

A typical aviation naphtha hydrogenation plant will make conversions of 50 to 75 per cent per pass, yielding 75 to 78-octane number hydrogenated naphtha having good stability, low sulfur content, and high lead susceptibility.

Fresh feed of light gas-oil characteristics is mixed with recycle stock coming back from the unit with fresh and recycle hydrogen. The mixture of oil and gas is passed through heat exchangers, then to a heater, and on to the reaction chambers. Cracking and hydrogenation take place in contact with the catalyst. After heat exchange, the reaction products are freed of hydrogen in a high-pressure separator and then pass to a stabilizer where the aviation naphtha is recovered.

High-octane blending agents are also produced by high-pressure hydrogenation of octenes available from polymerization of iso- and normal butylenes. The polymerization products made from the unsaturated compounds available in refinery gas usually have an 80 to 84-octane number, and are low in lead response. Upon hydrogenation, the saturated products have octane numbers in the range of 97 to 100 and also have a high lead susceptibility.

This type of hydrogenation can also be carried out at low pressures in another process. The low-pressure operation gives yields and products similar to the high-pressure operation. The choice of methods is dependent upon the particular circumstances involved.

The U.O.P. isooctane process also makes use of catalytic hydrogenation in making isooctane. The isooctene fraction made by catalytic polymerization has an octane number of about 83 and is converted to isooctane of 96-octane rating by catalytic hydrogenation.

The isooctanes made commercially have such a short boiling range that they are not a complete motor fuel as to volatility. Other fractions must be added, such as isopentane or isohexanes, to give the necessary volatility.

CATALYTIC DEHYDROGENATION

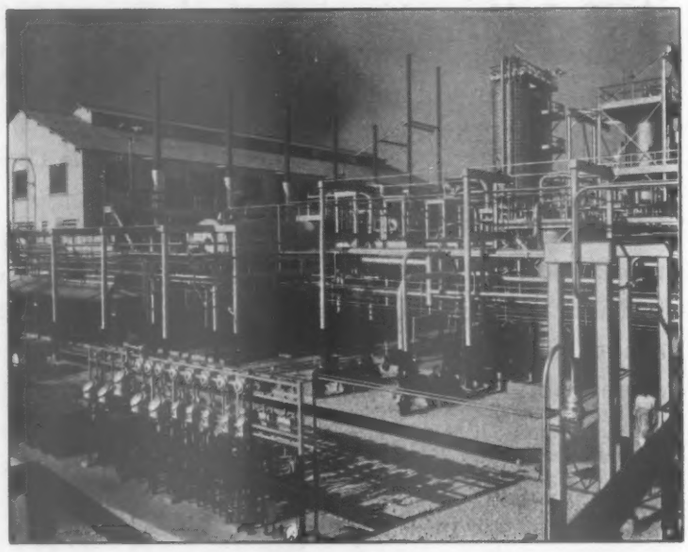
This type process is used to dehydrogenate propane and butane into propene and butene, which serves as charge material for polymerization. The processes employ alumina activated by metallic oxides as catalysts, operating at temperatures around 1050° F., and at atmospheric pressure. Approximately 90 per cent recovery of unsaturates can be effected.

Generally, catalytic dehydrogenation for converting saturates to olefins, for the production of charge material for polymerization, is more applicable to the fractions of natural gas or natural gasoline, since these contain practically all of the volatile hydrocarbons produced in refinery operations. Refinery gases contain relatively small amounts of saturates.

DESHIDROGENACION CATALITICA

Este tipo de procedimiento se usa para deshidrogenar el propano y el butano en propeno y buteno, los cuales sirven de material de carga para la polimerización. El procedimiento se vale de alúmina activada por óxidos metálicos, como agente catalizador, y se efectúa a temperaturas alrededor de 1050 grados Fahrenheit y presiones atmosféricas. Se logra como 90% de recuperación de insaturados.

Generalmente, la deshidrogenación catalítica, para convertir los saturados en olefines, es más aplicable a las fracciones de gas natural o de gasolina natural, pues casi todos los hidrocarburos volátiles producidos en la refinería provenienen de instalaciones de destilación por "cracking." Semejantes fracciones son ricas en olefines y son adecuadas como carga para unidad de polimerización, sin mucho procedimiento preliminar.



Rear of a new refinery unit, showing electrically powered pumps and controls. This is in Humble Oil & Refinery Co.'s plant at Baytown, Tex.

Vista trasera de una nueva refinería, provista de bombas y gobiernos accionados por fuerza eléctrica, en el establecimiento de la Humble Oil & Refinery Co., en Baytown, Texas

ALCALIZACION CATALITICA

Alcalización es el término que se aplica a la combinación de saturados e hidrocarburos de olefin. En el procedimiento, los olefínes como el buteno y propeno, se ponen ne contacto con parafinas o saturados, como el isobutano o propano, en presencia de catalizadores y bajo condiciones reguladas. Se efectúa una combinación entre las parafinas y los olefines, un átomo de hidrógeno de la parafina separando la doble unión del olefín y tomando posición, y la otra unión combinándose con la unión en la parafin, dejada vacante por el hidrógeno.

TRANSIT IN SOUTH AMERICA

TRANSIT EN LA AMERICA DEL SUR

The important South American oil industry is coming into its own, and TRANSIT, running true to form, is taking the very best of care of the pumping and power requirements in the refining, pipe line and production divisions.

Important installations have been made for the Argentine Government, International Petroleum Co., Ltd., Lago Oil and Transport Co. (Aruba), Curacaosche Petroleum Industrie Maatschappij (Curacao), Tropical Oil Co. (Barranca Bermeja), Mene Grande Oil Co., and many others.

SOUTH AMERICAN AGENTS:

Armco International Corporation Buenos Aires, Argentine Middletown, Ohio	For Argentine
Daniels and Flanders San Fernando, Trinidad, B.W.I. 30 Rockefeller Plaza, New York City.	For Colombia, Venezuela, Trinidad, B.W.I., & Curacao & Aruba, D.W.I.

La importante industria petrolera sudamericana está progresando admirablemente y TRANSIT, fiel a su misión, está dando la más prolija atención a los requisitos de bombas y fuerza motríz, en conexión con las fases de la refinería, líneas de tubería y producción.

Hemos hecho importantes instalaciones para el Gobierno Argentino, International Petroleum Co., Ltd., Lago Oil and Transport Co. (Aruba), Curacaosche Petroleum Industrie Maatschappij (Curaçao), Tropical Oil Co. (Barranca Bermeja), Mene Grande Oil Co., y muchas otras más.

AGENTES SUDAMERICANOS:

Armco International Corporation Buenos Aires, Argentina Middletown, Ohio, E.U.A.	Para la Argentina
Daniels and Flanders San Fernando, Trinidad, Antillas Holandesas 30 Rockefeller Plaza, Nueva York, N. Y., E.U.A.	Para Colombia, Venezuela, Trinidad, (Antillas Inglesas), Curaçao y Aruba (Antillas Holandesas).

TRANSIT ROTARY PUMPS

Furnished with or without built-in by-pass. High efficiency. Successfully used for following services:

Gathering Lines—Tank farm transfer—Pick-up service—Barge and tanker service—Bulk plants and terminals. Compounding.

Capacities 5 to 2250 gals. per minute. Working pressures to 200 lbs. Belt or motor drive. Write for *Bulletin No. 704* for detailed information.

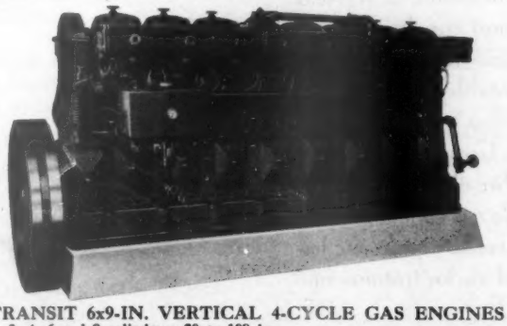
BOMBAS GIRATORIAS TRANSIT

Suministradas con derivación integrante o sin ella. Gran rendimiento. Se usan con éxito para los servicios siguientes:

Tuberías recolectores—Transferencia de tanque—Servicio de "pick-up"—Servicio de barca y buque tanque—Depósitos grandes y terminales—Trabajos de mezcla.

Capacidades de 5 a 2250 galones por minuto. Presiones de trabajos hasta 200 libras. Propulsión por correa o directa por motor.

Para información detallada, pídanos nuestro *Boletín No. 704.*



TRANSIT 6x9-IN. VERTICAL 4-CYCLE GAS ENGINES

Made in 2, 3, 4, 6 and 8 cylinders; 20 to 108 hp.

Compact and self-contained, twin ignition; automatic lubrication; all moving parts enclosed; over-head cam shaft; operates on natural, manufactured or refinery gas; low fuel consumption.

A high quality engine with low maintenance cost and moderate speed for heavy duty service and long life.

Write for *Bulletin No. 430* for detailed information regarding this engine.

MOTORES DE GAS TRANSIT VERTICALES DE 4 TIEMPOS DE 6 x 9 PULGADAS

Se ofrecen en modelos de 2, 3, 4, 6 y 8 cilindros, de 20 a 108 cdf.

Compactos y completos, con encendido doble, lubricación automática; todas las piezas móviles muy bien tapadas; árbol de levas elevado. Funcionan con gas natural, gas manufacturado o de refinería; bajo consumo de combustible.

Un motor de superior calidad, de bajo costo de conservación, de velocidad moderada, para trabajo pesado, que da muchos años de servicio.

Para descripción detallada de estos motores, sírvase pedirnos nuestro *Boletín No. 430.*

PRODUCTS

OILFIELD PUMPS: Pipe Line, Gathering Line and Tank Pumps.

REFINERY PUMPS: Steam or Gas Engine Driven Hot Oil Pumps; Tar and Residuum Pumps; a pump for every refinery service.

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PRODUCTOS

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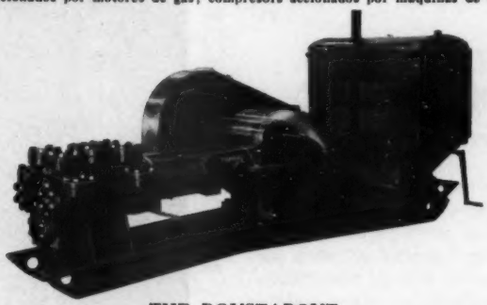
BOMBAS DE REFINERIA: bombas para petróleo caliente, accionadas par motores de gas o máquinas de vapor; bombas para alquitrán y residuos; una bomba para cada trabajo de refinería.

BOMBAS MARINAS: bombas para cargar petróleo, para aceite combustible, de carena y de lastre.

SERVICIO GENERAL: bombas de baja presión, giratorias, de émbolo y de fuerza mecánica.

MOTORES DE GAS—MAQUINAS DE VAPOR: motores de gas verticales y horizontales; compresores accionados por motores de gas; compresors accionados por máquinas de vapor.



THE ROUSTABOUT

A totally enclosed type power pump coupled to an internal combustion engine, mounted on a steel skid. Called "The Roustabout" because this husky outfit can be transported to any place in the field and it will do all kinds of pumping work, For gathering systems, booster stations, salvaging of oil, tank farm pumping, etc.

Dirt, dust, rain and snow are sealed out—the lubrication is sealed in.

Furnished with pumps of 4", 6", 10" and 12" strokes for pressures up to 1500 lbs.

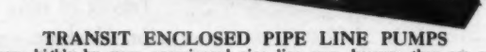
Description on request.

EL "ROUSTABOUT"

Una bomba mecánica totalmente tapada, acoplada a un motor de explosión interna, todo montado sobre patines de acero. Este grupo, llamado "Roustabout", puede transportarse a cualquier punto del campo y puede hacer toda clase de trabajo de bombar. Sirve para sistemas de tuberías colectoras, estaciones amplificadoras, recuperación de petróleo, trabajos de tanque, etc.

Esta protegido contra la tierra, polvo, lluvia y nieve. Su lubricación está muy bien encerrada.

Se suministra con bambas de 4, 6, 10 y 12" de carrera de émbolo, para presiones hasta de 1500 libras. Descripción detallada, a solicitud.



TRANSIT ENCLOSED PIPE LINE PUMPS

are regarded very highly by many experienced pipe line men, because they are so well adapted to pipe line work.

Strength is inherent by reason of correct design. The liquid cylinders are of forged steel with stuffing boxes integral. The whole assembly is solid and strong.

Accessibility is well taken care of in the design, and is further enhanced by extreme simplicity.

Durability too, has been attained by large roller bearings on main and pinion shafts, broad faced herringbone gears, and deep plunger stuffing boxes made especially long to minimize packing pressure on plungers. The power end is enclosed to keep dirt out, and lubrication in.

Sizes and Capacities: Sizes vary from the 3¼ x 12" to the 7¼ x 24" with capacities from 125 to 900 gallons per minute. Working pressures up to 1500 pounds.

Drive: Any type of drive, on either side. Illustration shows pads on power end for mounting electric motor.

BOMBAS TAPADAS TRANSIT PARA LINEAS DE TUBERIA

Gozan de gran preferencia entre los especialistas en líneas de tuberías, a causa de su perfecta adaptación a los requisitos de estos trabajos.

Su firmeza es inherente, debido a la excelencia de su tipo y construcción. Los cilindros de líquido son de acero forjado y las cajas de los prensaestopas forman parte integral de ellos. El grupo completo es sólido y firme.

La accesibilidad ha recibido particular cuidado en su proyecto y se acentúa más aún por la sencillez de la construcción.

Duración. Está asegurada mediante grandes cojinetes de rodillos en el cigüeñal y árbol del piñón, engranajes helicoidales dobles de cara ancha y profundas cajas de prensaestopas, de longitud adecuada, para reducir la presión de empaquetadura sobre los émbolos. El extremo de fuerza está tapado para evitar la entrada de polvo y proteger la lubricación.

Tamaños y capacidades: Los tamaños varían de 3¼ x 12" a 7¼ x 24", con capacidades de 125 a 900 galones por minuto. Cualquier tipo de transmisión, en cualquier lado. En la ilustración mostramos las placas en el extremo de fuerza para el montaje de motor eléctrico.

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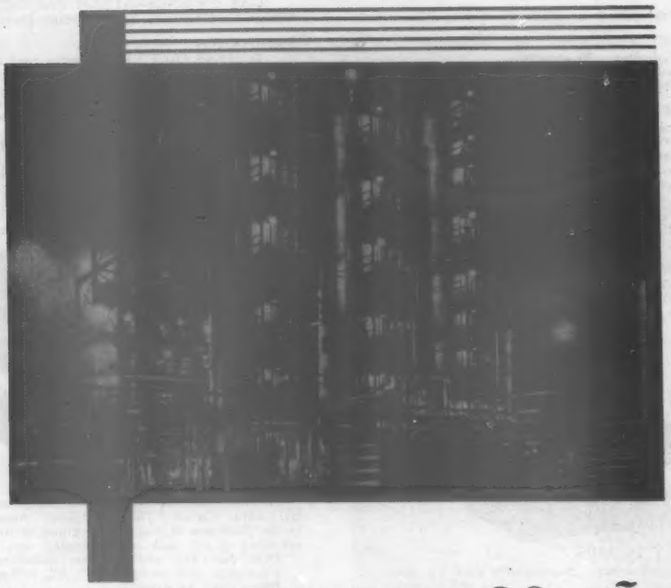

SERVICIO DURANTE 98 AÑOS

La organización Badger ha desempeñado importante papel en el desarrollo de procedimientos científicos industriales, desde hace 98 años. El conocimiento y la experiencia práctica en materia de procedimientos químicos dieron al servicio Badger particular importancia en conexión con la refinería del petróleo, cuando este producto adquirió valor comercial.

Talvez el más reciente triunfo más notable de la organización Badger, en la industria del petróleo, es su nombramiento, por parte de la Houdry Process Corporation, como agente autorizado para otorgar licencia sobre el procedimiento Houdry . . . un reconocimiento elocuente de sus conocimientos técnicos y facilidades para trabajos de construcción en los campos de la fraccionación, destilación al vacío, tratamiento disolutivo y desparafinación.

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Ingenieros y contratistas
en equipo de destilación y refinería de petróleo

fins would be more applicable to natural-gas or natural-gasoline fractions as the majority of the light hydrocarbons produced at the refinery are from the cracking units. These are rich in olefins and are suitable as charge to a polymerization unit without much preliminary processing.

CATALYTIC ALKYLATION

Alkylation is the descriptive title applied to the combination of saturated and olefin hydrocarbons. In the process, olefins, such as butene and propene, are brought into contact with paraffins or saturates, such as isobutane or propane, in the presence of catalysts and under controlled conditions. A combination between the paraffins and olefins is effected, a hydrogen atom from the paraffin breaking the olefin double bond and taking one position, the other bond combining with the bond in the paraffin left vacant by the hydrogen.

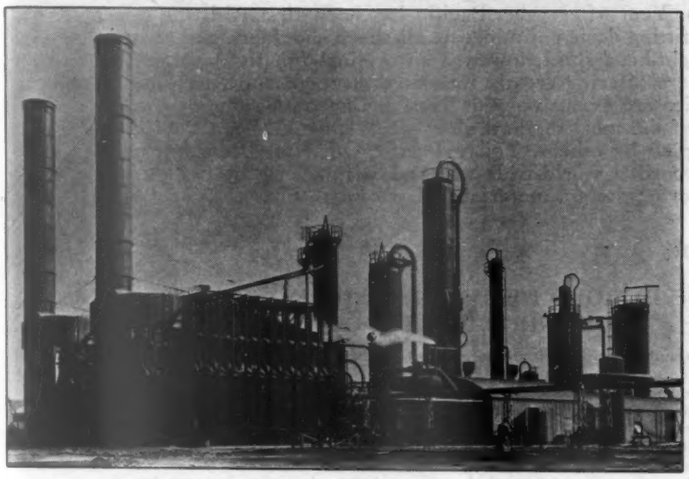
There are several processes in operation using such catalysts as sulfuric acid and aluminum chloride. Reaction temperatures of 35° to 100° F. are used, and pressures are atmospheric. The final product is isooctane, having octane numbers of 90 to 100.

THERMAL ALKYLATION

An interesting announcement recently made by the Phillips Petroleum Co. was in connection with building a thermal alkylation unit for the purpose of making a new aviation fuel ingredient called neohexane. It has been estimated that a very large increase in power can be obtained through using this material in transport or fighting planes over more conventional fuels.

Chemically, neohexane is 2, 2-dimethyl butane, a hydrocarbon somewhat similar in structure to isooctane. The material does not occur naturally and the fact that this rare hydrocarbon will now be made by synthesis is remarkable. Neohexane has a boiling point of 121° F. and an octane number of 95. Its effect, when blended with other ingredients is to permit the production of aviation gasoline in the neighborhood of 115-octane number.

Peculiarly enough, neither neohexane nor isooctane alone is suitable for aviation fuel due to unsatisfactory volatility. Isooctane is very low in volatility and so has to be blended with hydrocarbons. The inclusion of these lower octane number fractions so lowers the antiknock qualities that it is difficult to reach 100-octane number with lead. The volatility of neohexane is such that a mixture with isooctane makes a balanced fuel meeting distillation requirements and having an octane number close to 100. As the neohexane has good lead susceptibility, it is possible to reach octane numbers well above 100 when using tetraethyl lead.



Barnsdall Refining Co.'s new Corpus Christi, Tex., refinery
Nueva refinería de la Barnsdall Refining Co. en Corpus Christi, Texas

The raw materials for the process are: ethylene, a gas recovered from refinery vapors, and isobutane; a natural gas or refinery product of slightly higher vapor pressure than normal butane. Isobutane is heated to approximately 900° F. under pressure of more than 1,000 lb. per sq. in. Ethylene and isobutane are reacted in the alkylation furnace. Neohexane of the desired purity is recovered from the fractionation step following.

CATALYTIC ISOMERIZATION

Isomerization reactions, which may be described as the rearrangement of the internal structure of molecules, are important because, as a rule, the isomeric forms of the hydrocarbons are the more reactive and the synthesis of more complex hydrocarbons is thus aided. The isomerization processes so far announced are used to prepare charge

Hay varios procedimientos en operación, que usan catalizadores como el ácido sulfúrico y el cloruro de aluminio. Las temperaturas de reacción son de 35 a 100 grados Fahrenheit, con presiones atmosféricas corrientes. El producto final es isooctano, con número octano de 90 a 100.

ALCALIZACION TERMAL

Un interesante anuncio hecho recientemente por la Phillips Petroleum Co., se refirió a la construcción de una instalación de alcalización termal para la producción de un nuevo ingrediente de combustible de motor de aviación, llamado neohexano. Se dice que con el empleo de este combustible se asegura un gran aumento de fuerza en los motores de aviones militares y de transporte.

Químicamente, el neohexano es butano dimetílico de 2,2, un hidrocarburo similar, en estructura, al isooctano. El material no se presenta naturalmente libre, y el hecho de este raro hidrocarburo se producirá por procedimiento sintético, es cosa muy admirable. El neohexano tiene punto de ebullición a 121 grados Fahrenheit y un número octano de 95. Su efecto, cuando se mezcla con otros ingredientes, es facilitar la producción de gasoline de aviación con número octano alrededor de 115.

Es interesante observar que ni el hexano ni el isooctano, independientemente, es adaptable a combustible de aviación, debido a su insatisfactoria volatilidad. El isooctano tiene muy baja volatilidad y por esta razón tiene que mezclarse con otros hidrocarburos. La inclusión de esta fracciones de menor número octano le reduce tanto sus propriedades antidetonantes, de que se hace muy difícil subirlo a número octano de 100 con la adición de plomo. Por su parte, la volatilidad del neohexano es tal, que su mezcla con isooctano produce un combustible compensado, que satisface los requisitos de la destilación y que tiene un número octano próximo al 100. Como el neohexano tiene buena susceptibilidad al plomo, es posible llegar a número octano superior al 100, con la adición de tetraetilio de plomo.

Las materias primas para el procedimiento son: etileno, un gas recuperado de los vapores de refinería, e isobutano, un gas natural o producto de refinería, de presión de vapor levemente mayor que la del butano normal. El isobutano se calienta a cerca de 900 grados Fahrenheit, bajo presión de más de 1000 libras por pulgada cuadrada. En el horno de alcalización se produce la reacción del etileno e isobutano. De la fraccionación siguiente se recupera el neohexano de la pureza deseada.

ISOMERIZACION CATALITICA

Las reacciones de isomerización, que pueden describirse como el reaarreglo de la estructura interna de las moléculas, son importantes porque, por lo general, las formas isoméricas de los hidrocarburos son las más reactivas, lo cual ayuda a la síntesis de los hidrocarburos más complejos. Los procedimientos de isomerización, hasta ahora aunciados, se usan para preparar la carga para la alcalización. Usando cloruro de aluminio, como catalizador, y funcionando a una temperatura de como 200 grados Fahrenheit y 200 libras de presión por pulgada cuadrada, el butano *n* y el heptano *n* se convierten en isobutano e isopentano con un valor de rendimiento alrededor de 75%.

UNIDADES DE COMBINACION

Se ha terminado la construcción de varias instalaciones, relativamente grandes y se están llevando a cabo grandes proyectos de modernización de instalaciones antiguas. En todo caso, se incluyen unidades de combinación, para la conversión de petróleo crudo en gasolina y otros productos. La destilación primaria parcial, la destilación por desintegración o "cracking," la reformación y hasta la polimerización, se combinan ahora en una sola instalación. Se han construído instalaciones que tienen hasta 36.000 barriles diarios de capacidad de carga.

Las unidades o instalaciones de combinación entran, por lo general, en todo programa de reemplazo de alambiques tubulares o anticuados alambiques de "cracking," a causa de la reducción en costo de combustible y otros gastos, y también, por la mayor flexibilidad del trabajo. Una reciente instalación no sólo comprende la producción de gasolina, sino también de kerosina y petróleos de horno, o la producción simultánea de disolvente de caucho nafta, V.M.&P., solvente Stoddard y kerosina.

CALENTADORES

La tendencia moderna en tipo de calentador es construir el calentador para una función determinada, y particularmente en la unidad o instalación de combinación, los varios elementos se construyen para hacer un trabajo deninido en cada caso. Los factores que entran en el proyecto comprenden el rendimiento termal, la carga de calor, la distribución del calor y el efecto del tiempo y temperatura sobre el petróleo por cargarse en el calentador. Los calentadores se construyen para calentar solamente, sin ninguna descomposición. Cuando en adición al calentamiento, hay parcial descomposición, ésta se efectúa en los tubos, y cuando hay descomposición completa, ésta se efectúa en el serpentín.

Una instalación de combinación, recientemente construída, tiene tres hornos de serpentines múltiples. El

PACIFIC

Pre-tested Design and Engineering

Streamlined Deep Oil Well Plunger Pumps in All Types

Built to increase pumping efficiency by minimizing fluid friction and eliminating turbulances, Pacific Plunger Pumps offer the oil well operator a pump type and fitting combination to meet every pumping condition. Year after year, Pacific has been first with the latest. Streamlined fitting design eliminating all sharp shoulders and obstructions to straight-head fluid flow was an original Pacific development. "Moloy" Liners offering greatly increased strength and corrosion resistant qualities are exclusive with Pacific. Chromium plated plungers and the use of the most modern alloy steels have all been Pacific innovations copied by others. Today Pacific Oil Well Plunger Pumps have been accorded world-wide acceptance in every oil field as the result of superior design, material and workmanship.

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BOMBAS DE EMBOLO DE TOPI PERFILADO PARA POZOS PROFUNDOS, DE TODO TIPO

Construidas para aumentar el rendimiento efectivo, mediante reducción del rozamiento o fricción del líquido y supresión de la turbulencia, las bombas de émbolo Pacific ofrecen a los explotadores de pozos de petróleo un tipo de bomba y una combinación de conexión, para satisfacer cualquier requisito o condición de trabajo. Año tras año, la Pacific ha sido la primera en ofrecer las más recientes innovaciones del ramo. El estilo perfilado de las conexiones, que suprime todas las protuberancias agudas y otras obstrucciones a la corriente expedita del líquido en línea recta, fué un perfeccionamiento original de la Pacific. Los émbolos con enchape de cromo y el uso de las más modernas aleaciones de acero, han sido también innovaciones introducidas por la Pacific, que posteriormente fueron copiadas por otros fabricantes. Hoy en día, las bombas de émbola Pacific para pozos de petróleo, gozan de reputación mundial, gozando de envidiable aceptación en todos los campos petrolíferos, en virtud de su superioridad en tipo, materiales y construcción en general.

Pacific Centrifugal Pumps meet efficiently and economically every requirement of refinery and pipe line pumping. Pacific design provides safety, simplicity and compactness in handling temperatures up to 850° F., differential pressures up to 2500 lbs., capacities from 50 G.P.M. to 2700 G.P.M., under low or high suction pressure conditions. Exclusive Hot Oil Pump features include a balanced mechanical floating seal, double-cooled, removable steel stuffing boxes and other progressive engineering designs.

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Las bombas centrífugas Pacific satisfacen, con eficacia y economía, todo requisito de servicio de bombar de refinería y línea de tubería. El tipo Pacific representa seguridad, sencillez y eficacia en el manejo del trabajo. Estas bombas sirven para temperaturas hasta de 850 grados F., presiones diferenciales hasta de 2500 libras, y capacidades de 50 a 2700 galones por minuto, bajo condiciones de presión de aspiración baja o alta. Entre los rasgos exclusivos de las bombas para petróleo caliente se incluyen cierre flotante mecánico compensado, enfriamiento doble, estoperos de acero desprendibles y otros refinamientos de ingeniería adelantada.

★ ★

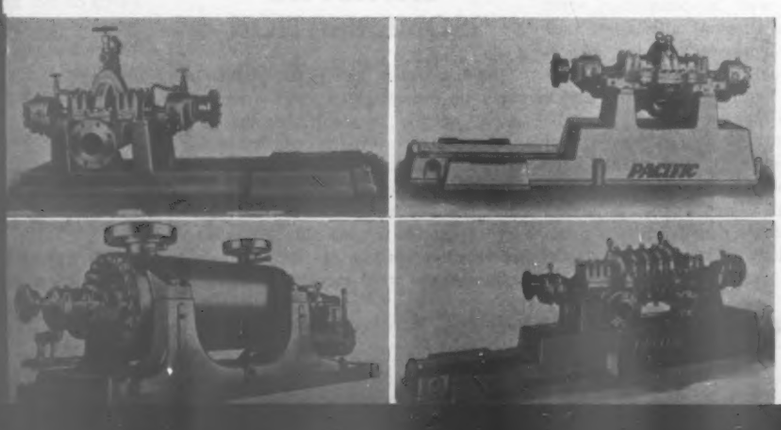
Send for your copies of these new bulletins giving complete details on Pacific Streamlined Oil Well Plunger Pumps and Pacific Hi-Pressure Centrifugal Hot Oil Pumps.

★ ★ ★

Pídanos ejemplares de nuestros nuevos boletines en que damos información detallada sobre las bombas de émbolo Pacific, de tipo perfilado, para pozos de petróleo y las bombas centrífugas Pacific Hi-Pressure para petróleo caliente.

PACIFIC PUMPS

PUMP WORKS



for alkylation. Using aluminum chloride as a catalyst and operating at approximately 200° F. temperature and 200 lb. per sq. in. pressure, *n*-butane and *n*-heptane are converted to isobutane and isopentane with a yield value of around 75 per cent.

COMBINATION UNITS

Several relatively large plants have been completed or extensive modernization projects carried out recently and in each case combination units were erected for converting crude oil into gasoline and other products. Skimming, cracking, reforming, and even polymerization, are now combined in the operation of a single unit. Units have been built ranging up to 36,000 bbl. of crude daily charging capacity.

Combination units are generally considered when replacing outmoded tube stills and obsolete cracking stills because of the reduction in fuel costs and other expenses, and the provision of greater flexibility. A recent installation provides not only for the production of gasoline, but also kerosene and furnace oils, or the simultaneous production of rubber solvent, V.M.&P. naphtha, Stoddard solvent, and kerosene.

HEATERS

The modern trend in heater design is to build the heater for a specific function and particularly in the combination unit, the several elements are constructed to perform a definite duty in each case. Design factors involve thermal efficiency, heat load, heat distribution, and time-temperature effect on the oil to be charged to the heater. Heaters are designed for heating only with no decomposition; where in addition to heating, partial decomposition takes place in the tubes; and where practically complete decomposition takes place in the coil.

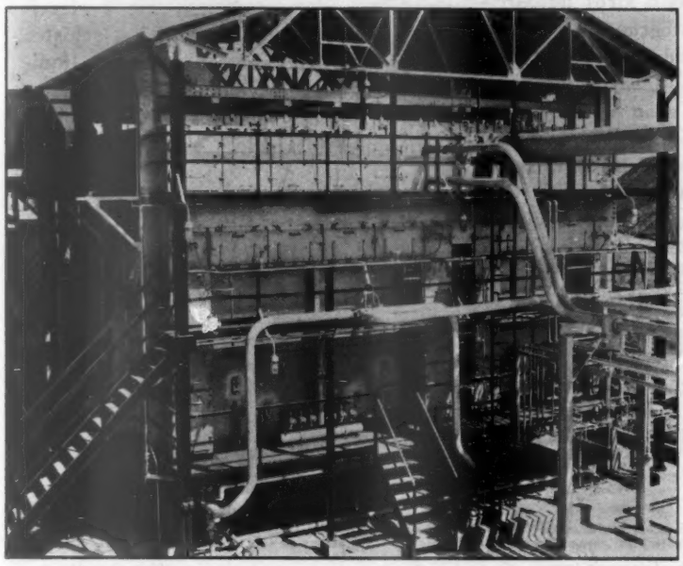
A recently completed combination unit has three multicoil furnaces. The crude heater and viscosity breaker are included in the first furnace; a reformer and viscosity-breaking coil in the second furnace; and four coils for clean oil cracking in the third furnace. The latter furnace is quite interesting, having 20,000 sq. ft. of heating surface, circulation of about 50,000 bbl. of hot oil per day, and requiring 256 burners to supply gas for combustion.

Probably the greater part of the fuel requirements of the modern refinery is met with refinery-produced gas. This is augmented with natural gas where available, and with fuel oil in other places. Therefore, in making improvements in heaters as a whole, considerable attention has been paid to burner design. This applies particularly to gas burners and also to combination gas and oil burners.

The definite trend of late has been toward the development of burners that produce a short flame. Faster combustion brings about a higher flame temperature when less excess air is used and complete combustion is secured.

Recent improvements have been made in the design of air registers to improve the center-fired diffusion and ring burner types. The fan mix type, where gas and air are mixed by a fan propelled by the gas itself, finds wider application. Improved types of partial premix burners are found to meet certain requirements. Multi-jet designs have recently appeared where control of the combustion zone can be had by changing the angle of the jets. Some are semi-premixing type while others depend on after-mixing in the furnace itself. Application is being found for

(Continued on Page 296)



Furnace, lubricating distillate solvent extraction unit

Horno de una instalación de extracción, por el procedimiento disolutivo, de destilado lubricante

calentador del petróleo crudo y separador de viscosidad se incluyen en el primer horno; un reformador y serpentín de separación de viscosidad se comprenden en el segundo, y cuatro serpentines para la destilación por desintegración o cracking del petróleo limpio forman parte del tercer horno. Este último horno es bastante interesante. Tiene 20.000 piés cuadrados de superficie de calentamiento, circulación de casi 50.000 barriles de petróleo caliente, al día y requiere 256 quemadores para el suministro del gas empleado en la combustión.

Probablemente la mayor parte de los requisitos de combustible de la refinería moderna se satisface con el gas producido en la misma refinería. Esto se aumenta con gas natural, cada vez que se puede, o con aceite combustible, en otros casos. Por esta razón, al introducirse refinamientos en los calentadores, en general, se ha dado mucho atensión al tipo de construcción de los quemadores. Esto se aplica muy en particular a los quemadores de gas y también, a los quemadores de combinación de gas y petróleo.

La tendencia definida de estos últimos tiempos ha sido hacia el desarrollo de quemadores que producen una llama corta. La combustión más rápida produce una mayor temperatura de llama, con menos exceso de aire y un resultado más completo.

Los reguladores de aire han recibido ultimamente ciertos refinamientos, pamejorar la difusión de los quemadores de acción central y de tipos anulares. El tipo de ventilador de mezcla, en que el gas y el aire se mezclan por un ventilador accionado por el gas mismo, tiene ahora una aplicación más extendida. Hay tipos perfeccionados de quemadores de mezcla preliminar parcial, que satisfacen ciertos requisitos especiales. Recientemente han aparecido tipos de surtidores múltiples, que regulan la zona de combustión mediante el cambio de la angularidad de los surtidores. Algunos son del tipo de mezcla semi preliminar, mientras otros dependen de las mezcla posterior en el mismo horno. Se ha hallado aplicación a los tipos perfeccionados de quemadores de mezcla preliminar o anterior, en los cuales el aire es mezclado con el gas afuera del horno, graduación de válvulas o de la inyección por el venturi.

Es difícil quemar aceite combustible en un horno proyectado para gas y provisto de corriente natural. En tales casos, es necesario aplicar una corriente forzada a la zona de combustión, para aumentar su intensidad.

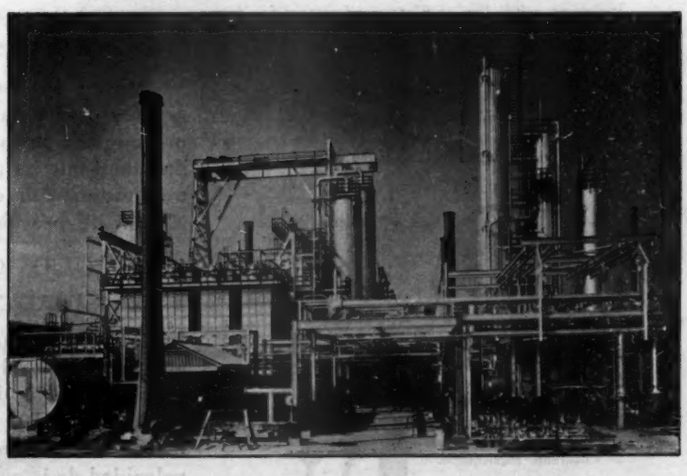
Los quemadores de combinación, para aceite combustible y gas, se regulan principalmente por el tipo de entrada de aire, para establecer una corriente forzada, que pase por la zona de combustión. Los más recientes tipos proveen rasgos que permiten una rápido cambio de un combustible al otro.

Los tubos de los alambiques están expuestos a depósitos de coque y bajo condiciones de alta temperatura, se pueden formar en ellos grandes cantidades de coque endurecido. La remoción de este material, durante las limpiezas, se hace generalmente por corriente forzada por turbina.

Para la limpieza o extracción de las acumulaciones de coque en los tubos de los alambiques se ha perfeccionado un nuevo método, en el cual se comprende la utilización del calor, vapor y aire. Después de tratados los tubos con vapor, de la manera de costumbre, el horno se calienta a como 1200 grados Fahrenheit, dejando que el vapor pase por los tubos en una cantidad cuidadosamente regulada. Cuando decae el régimen de salida del coque, se invierte la dirección de la corriente de vapor y se admiten pequeñas inyecciones de aire. Finalmente se admite aire solo, para quemar las porciones restantes de coque que no fueron quitadas por el vapor. Después de enfriado el horno, los tubos se lavan con agua.

Las ventajas que se asignan a este

(Continue en Pagina 296)



Catalytic cracking unit completed late this year in a northeastern refinery

Instalación de "cracking" catalítica, completada a fines de este año, en una refinería del noreste

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Front view of Orifice Meter

Vista de lantern del contador de orificio.

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Round Case Indicating Flowmeters

Contadores de corriente "flowmeters", de indicación, con caja redonda.

Segmental Dial
Cuadrante segmentario.

Round Dial (at right)
Cuadrante redondo.

1379

PRODUCTOS

CONTADORES: de demanda, de desplazamiento (para gas o aire) de corriente, de indicación, integrante o totalizador, de registro, de laboratorio, de orificio, de oxígeno, de ensayo líquido y seco, de orificio de gran alcance, etc. INDICES: de presión básica, de volúmen básico, de demostración, etc. GOBIERNOS O CONTROLES: de corriente, de nivel líquido, de presión, de velocidad y cantidad, de gobierno a distancia. MANOMETROS: diferenciales, de volúmen y presión. REGULADORES: de cierre automático de gas, de contrapresión, de válvula de compensación, de gas embotellado, de presión de gas y aire, de alta presión, etc. APARATOS DE ENSAYOS Y PRUEBAS. VALVULAS, etc.

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Estos controles o gobiernos mantienen, con seguridad, el régimen de velocidad de los gases o líquidos, a un valor máximo predeterminado, regulando automaticamente el diferencial producido por la velocidad de la corriente que pasa por un orificio. También, controles proporcionales y de nivel líquido.

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Ironcase Meter with Case Removed

Contador en caja de hierro, destapado.

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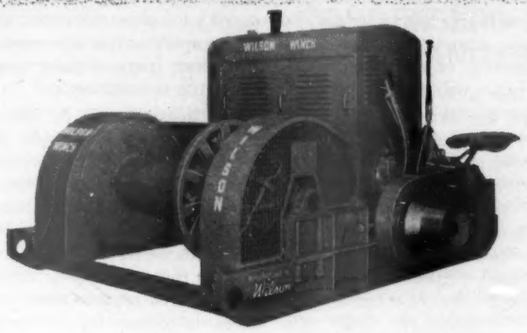
Un completo surtido de tipos de alta y de baja presión, incluyenda la nueva válvula de compensación de combinación. Notables por la facilidad de su conservación y también por la exactitud de su gobierno.

New CBV Regulator

Nuevo regulador CBV.



★WILSON SUPER MODEL Single Drum Winch showing new streamlined guards. Furnished with either Friction or Jaw Clutches in Drum. Rated capacity, 4,000 to 5,000 ft. wells. This type machine is built in seven sizes, suitable for use on 2,000, 3,000, 4,000, 5,000, 6,000, 8,000, and 10,000 ft. wells. The most popular of all types of oil field winches, this machine is recognized as the strongest and most reliable of all machines in its class.

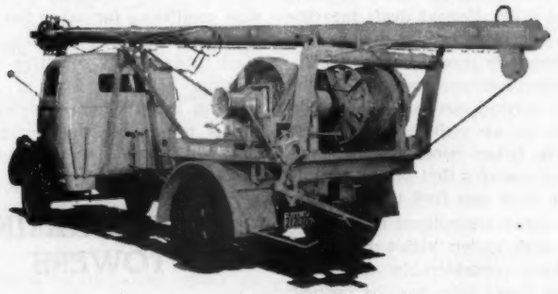
MODELO WILSON SUPER de montacarga de un tambor, con nuevos resguardos perfilados. Suministrado con embrague de fricción o de mandíbula en el tambor. Capacidad de 4.000 a 5.000 piés. Este tipo de máquina se construye en siete tamaños, adaptados a pozos de 2.000, 3.000, 4.000, 5.000, 6.000, 8.000 y 10.000 piés de profundidad. El más popular de todos los montacarga de campo petrolífero, esta máquina está aceptada como la más firme y segura de todas las de su clase.

★WILSON SUPER MODEL WINCH on W-40 International Harvester Tractor. Can be furnished for use with Gas, Gasoline, Kerosene, or Diesel fuel. Available in both Single and Double Drum Models, with or without mast pole, and jerk line spudder. Built in one size only; suitable for use on wells up to 5,000 feet. Without question, the finest machine of its type.

MODELO WILSON SUPER de montacarga instalado en un tractor International Harvester W-40. Puede suministrarse para funcionar con gas, gasolina, kerosina o combustible de diésel. Se ofrece en modelos de un tambor y de dos tambores, con mástil o sin él, y perforador inicial con cable agitador. Se ofrece en un solo tamaño; se adapta a uso en pozos hasta de 5.000 piés de profundidad. Sin la menor duda, la mejor máquina de su clase.

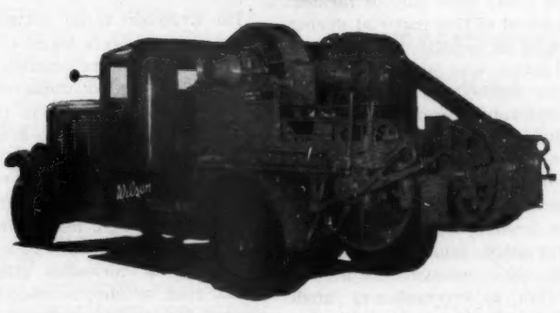
★WILSON MASTER MODEL SPEED WINCH on Cab-over-engine Ford Truck, with 7-8-50 ft. Single Mast pole. Wilson Split-Shaft Power-take-off and bevel gear transmits truck engine power to drum through Wilson Internal Expanding Friction Clutch in drum. With space for tool house between cab and winch, this is an ideal portable well servicing unit.

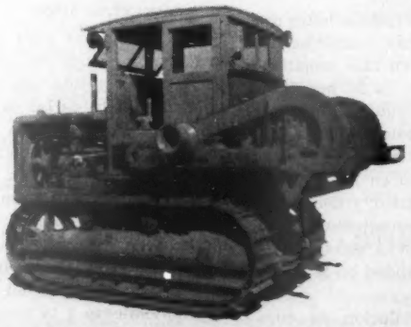
MODELO WILSON MASTER DE MONTACARGA RAPIDO istalado en un camión Ford de garita sobre motor, con mástil sencillo de 7-8-50 piés. Un tomafuerza Wilson de árbol seccionado y engranaje helicoidal cónico transmite la fuerza del motor del camión, al tambor, mediante un embrague de fricción Wilson de extensión interior, en el tambor. Con espacio para caja de herramientas entre la garita y el montacarga, el presente es un equipo portátil ideal para el servicio de pozos.



★WILSON MOGUL MODEL Double Drum Winchmobile suitable for use on wells up to 6,000 feet. A portable, self-contained pulling unit built specially for export requirements. Model shown is equipped with cab, PA-100 IHC power unit, heavy duty axles, and special Wilson Power-take-off. Made in three sizes, for use on wells 3,000, 4,500, and 6,000 ft. deep. Friction or Jaw Clutches in either drum. Mast pole and crank spudder also available. The outstanding machine of its type.

MODELO WILSON MOGUL de montarga portátil "Winchmobile" de doble tambor, para uso en pozos hasta de 6.000 piés de profundidad. Un completo equipo portátil, adaptado especialmente a los requisitos de exportación. El modelo mostratado está equipado con garita, grupo de fuerza PA-100, ejes de trabajo pesado y tomafuerza especial Wilson. Se ofrece en tres tamaños, para uso en pozos de 3.000, de 4.500 y 6.000 piés de profundidad. Embragues de fricción o de mandíbula en cualquier tambor. Mástil y equipo de perforación inicial de manivela, cuando se indiquen. La principal máquina de su tipo.





★WILSON SUPER MODEL WINCH on Caterpillar RD-6 tractor. Made in two sizes suitable for wells 4,500 and 6,500 ft. depth. Furnished with or without cab, mast pole, spudder, and with either Jaw or Friction clutches in drum. Highly useful for undeveloped areas where the crawler tractor will prove highly useful on other work. Can be furnished on Caterpillar, Cletrac, or IHC tractors. Unsurpassed in machines of its type.

MODELO WILSON SUPER de montacarga en tractor Caterpillar RD-6. Ofrecido en dos tamaños, adaptados a pozos de 4.500 y 6.500 piés de profundidad. Suministrado con garita, mástil, perforador inicial y con embragues de fricción o de mandíbula. en el tambor. Muy útil para campos todavía no desarrollados, donde el tractor de carriles puede aprovecharse ventajosamente en otros trabajos. Puede suministrarse montado en tractores Caterpillar, Cletrac o International Harvester. Sin rival en su clase.

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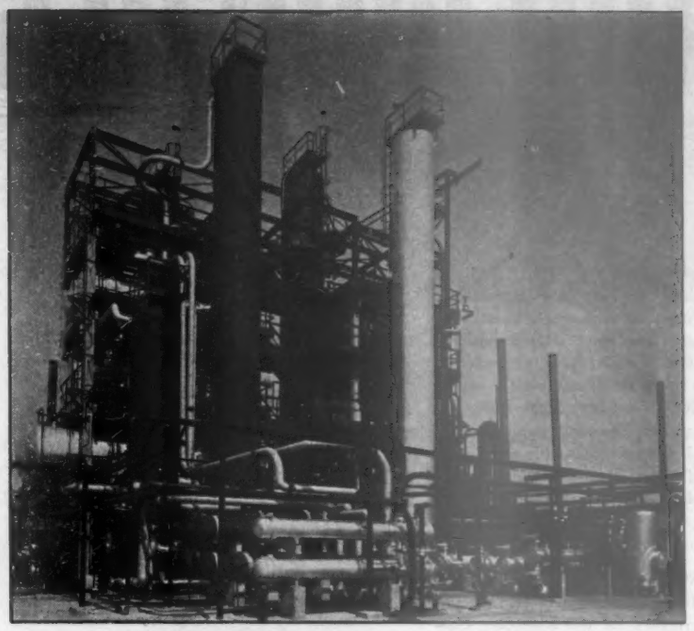


Polymerization unit recently completed in a North Louisiana refinery

Instalación de polimerización recientemente añadida a una refinería en el norte de Luisiana

improved types of premix burners where the air is premixed with the gas outside the furnace by proportioning valves or venturi injection.

It is difficult to burn fuel oil in a furnace designed for gas and using natural draft. Forced draft into the combustion zone to increase the rate of combustion should be provided.

Combination burners for oil and gas are largely governed by the design of the air register to force air into the firing zone. New designs embrace features that permit a rapid change from one fuel to the other.

Still tubes are subject to coke deposits and under high-temperature conditions, considerable quantities of hard, flinty coke may be formed. The removal of this material during clean outs is usually accomplished by turbining.

A new method of cleaning coke out of still tubes has been developed, involving the use of heat, steam, and air. After the tubes are steamed in the usual manner, the furnace is fired to around 1200° F. with steam passing through the tubes in a carefully regulated quantity. When the rate of coke removal drops, the steam flow is reversed and small amounts of air are admitted. Finally, only air is admitted in order to burn off the remaining patches of coke which were not removed by the steam. After cooling the furnace, the tubes are flushed with water.

The advantages claimed for this method are: cleaner tubes can be obtained, two men can handle the operation, no metal is lost from the tubes through cutting by careless drilling, noise and dust are eliminated, and a continuous coil can be welded, doing away with headers and fittings. Disadvantages that may be encountered are: burning of the tubes if furnace fire and air admitted to the tubes are not properly controlled, possible erosion due to excessive steam velocities, development of leaks at the headers, and possible accelerated spreading and distortion of the headers. Unfavorable conditions for using the method are: too thick coke deposits, carbon-steel tubes highly sensitive to overheating, coke deposits in unfired soaking tubes where external heating is impossible, and certain type coke which will not respond to air oxidation.

FRACTIONATING TOWERS

The principal trend noticeable in fractionating towers seems to be the one of size. Towers running to 100 ft. in height are not uncommon and provide great flexibility in the matter of taking cuts. Towers are fusion welded, radiographed and stress relieved. It is customary now to make corrosion allowance and add more metal to the shell, heads, and nozzles. Bubble trays and tray supports are given a corrosion allowance. Metal, such as chrome nickel alloy, is used for the top decks for crude flash towers.

As the number of operations in a unit increases, the number of towers per unit likewise increases. The ability to do this and add to unit flexibility, without penalty in operation, adds to the attractiveness of the combination unit.

INSTRUMENTATION

As modern units get more complex, or as units become more sensitive to variation, a greater need arises for automatic control through instruments. Stability or smoothness

método son: se obtienen tubos más limpios; dos hombres pueden hacer todo el trabajo; no se pierde metal de los tubos a causa de un descuidado trabajo de taladradura o raspaje; se evitan el ruido y el polvo, y se puede soldar un serpentín contínuo, eliminándose cabeceros y guarniciones. Las desventajas que pueden presentarse son: quemadura de los tubos cuando no se regulan bien al calor y el aire admitidos; posible erosión debido a las excesivas velocidades del vapor, desarrollo de escapes en los cabeceros y posible extensión y distorsión prematuras de los cabeceros. Las condiciones desfavorables para el uso de este método de limpieza, son: acumulaciones de coque muy espesas, tubos de aleación de acero y carbono demasiado sensitivos al recalentamiento, acumulaciones de coque en tubos que no están recibiendo debido calor y que no pueden ser calentados por afuera, y el coque de cierto tipo, que no responde a la oxidación con aire.

TORRES FRACCIONADORAS

La tendencia principal discernible en materia de torres fraccionadoras parece ser en el sentido de tamaño. No son ya poco comunes las torres que se levantan hasta 100 piés de altura, asegurando gran flexibilidad en la separación de las fracciones. Las torres se soldan por fusión, se radiografian y libran de tensión. Se acostumbra ahora hacer concesiones para la corrosión y agregar más metal al casco, cabezas y boquillas. Las bandejas de burbujeo y sus soportes tienen también su concesión para corrosión. Metales, como la aleación de cromo y níquel, se emplean para las cubiertas superiores de las torres.

Con el aumento de operaciones en una instalación o unidad, crece también el número de torres de cada instalación. La facultad para hacer esto y aumentar la adaptación o flexibilidad de la instalación, sin penalizar la producción u operación, aumenta la conveniencia de la instalación combinada.

INSTRUMENTOS

A medida que las instalaciones modernas se ponen más complejas o a medida que se ponen más sensitivas a variación, mayor es la necesidad de regulación automática, mediante instrumentos. La estabilidad o continuación expedita del trabajo es el rasgo más apetecido en los sistemas de gobierno automático, y deben emplearse entonces sólo aquellos instrumentos que tiendan a establecer y asegurar esta estabilidad en la operación.

La moderna instalación de combinación, con sus muchas torres y sus numerosos hornos en correlación, requiere una gran cantidad de instrumentos. Los contadores y reguladores de petróleo, para gobernar las cargas de petróleo crudo, la cantidad de petróleo espeso o grueso extraído del fondo de la torre fraccionadora, y los instrumentos para medir la producción de gas, se incluyen entre las necesidades modernas. Los reguladores de nivel del líquido, los indicadores de nivel, los reguladores de contrapresión, los reguladores de temperatura, los pirómetros registradores y los potenciómetros, son otros tantos aparatos que se emplean corrientemente para regular las condiciones de la instalación.

Los instrumentos de una instalación Houdry, por ejemplo, son bastante numerosos. Una reciente instalación, puesta en operación, se dice que tiene 13 reguladores de corriente, el mismo número de reguladores de nivel de líquido, 8 contadores registradores de corriente, 2 termómetros registradores, 4 reguladores de temperatura, 5 reguladores de presión, 14 potenciómetros y 7 otros instrumentos misceláneos. Uno de los dispositivos más ingeniosos de esta instalación es el distribuidor de ciclo, que sirve para accionar automaticamente las válvulas conectadas a las cajas del catalizador.

Los fabricantes de instrumentos están mostrando extraordinaria habilidad en suministrar aparatos bien adaptados al gobierno o regulación de las condiciones de operación de las complejas instalaciones modernas. Los instrumentos van siempre al mismo paso acelerado que lleva el progreso en las instalaciones.

BOMBAS

Amplia aplicación tienen los varios tipos de bombas, incluyendo las de movimiento alternativo accionadas por máquina o motor de vapor o turbina de vapor, y motor eléctrico, y centrífugas accionadas por motor de explosión interna. Las bombas centrífugas se usan para cargar, transferir y devolver el reflujo. La bomba de movimiento alternativo, enfriada por aceita, de baja velocidad, tiene aplicación en la circulación de petróleo caliente. Las bombas centrífugas, en su mayor parte, están instaladas en las unidades de combinación, con sus muchas variedades de condiciones, debido a la suavidad de su acción y la ausencia de vibración de línea.

Una asignación algo nueva para una bomba en una refinería es bombar la sal derretida, que se usa para el enfriamiento de las cajas de catalizador en la instalación Houdry recientemente perfeccionada. Se usan bombas de sumidero. Un nuevo equipo, muy interesante, que no es precisamente una bomba, se emplea también en esta instalación. Es un turbocompresor Brown-Boveri. Los vapores de las cajas del catalizador dan movimiento a la turbina de gas caliente, la cual está conectada directamente al compresor, el cual comprime el aire para las cajas.

Nuevos problemas se presentan continuamente al fabricante de bombas, en conexión con la fabrica-

or operation is the most desirable feature in automatic-control systems and instruments should be used which tend to smooth the operation as a whole.

The modern combination unit with its many interrelating towers and furnaces requires a large amount of instrumentation. Flow meters and flow controllers to regulate the raw oil charge, the amount of the heavy oil pumped from the bottom of the fractionating tower, and to measure gas production, are provided. Liquid-level controllers, level indicators, back-pressure controllers, temperature controllers, recording pyrometers, and potentiometers are other devices regularly used to regulate conditions throughout the unit.

The instrumentation of a Houdry unit, for example, is rather extensive. A recent unit placed on stream is reported to have 13 flow controllers, the same number of liquid-level controllers, 8 recording flow meters, 2 recording thermometers, 4 temperature controllers, 5 pressure controllers, 14 potentiometers, and 7 other miscellaneous instruments. One of the most ingenious devices on this unit is the cycle timer which automatically operates the valves connected to the catalyst cases.

Instrument makers are showing great skill in providing proper devices for controlling operating conditions in the modern complex units. Numerous improvements are being made each year and the instruments keep pace with progress.

PUMPS

The various classes of pumps, including steam-driven reciprocating and steam turbine, and electric motor or engine-driven centrifugal pumps, find application. Centrifugal pumps are used for charging, transfer, and returning reflux. The oil-cooled, slow-speed, reciprocating pump finds application in circulating hot oil. Centrifugal pumps are in the majority on combination units with their many varieties of conditions because of the smoothness of action and absence of line vibration.

A rather novel assignment for a pump in a refinery is that of pumping molten salt for cooling catalyst cases in the newly developed Houdry unit. Sump-type pumps are used. While not exactly a pump, a very interesting new piece of equipment is also used with this unit, this being a Brown-Boveri turbo-compressor. Fumes from the catalyst cases drive the hot-gas turbine which is directly connected to the compressor, which in turn compresses air for burning off the catalyst cases.

New problems are thrust upon the pump manufacturer in designing equipment for the new processes. Alloy parts and liners are overcoming corrosive conditions. However, the high pressures in polymerization and alkylation processes require pumps able to deliver highly volatile material to furnaces under considerable pressure and call for something out of the ordinary in pumps. A unit is now building which will operate at 5,000 lb. pressure in the heating coil, thus placing a severe load on the charging pump.

CONDENSERS AND EXCHANGERS

The efficiency of a unit depends largely upon heat saving through the medium of exchangers. These are designed to give improved heat transfer and longer serviceability. Considerable attention has been paid to the materials going into exchangers because the hot, corrosive gases place a burdensome load on tubes and various alloys are being used to meet these conditions.

A departure from the conventional design of heat exchangers is the newly developed spine tube heating surface. In this method of construction, it is possible to have as much as 20 times the external area on a tube as a plain tube of the same inside diameter. The same heat transfer can be accomplished with a smaller heat exchanger in many cases.

The spine tubes are formed by machining the spines on thick wall tubes, the spines being a part of the tube itself. The spines can be made with varying widths, lengths, and spacing to meet conditions imposed by the fluid that will be handled. These tubes can be made of the various metals commonly employed in the fabrication of exchangers. Of interest to the refiner, is the fact that the capacity of existing shell and tube-type exchangers can be increased by simply replacing the common smooth wall tubes with the spine-tube type.

VALVES

Valves used in the modern combination unit, hydrogenation, or polymerization plant must meet many severe conditions. Temperatures and pressures are constantly being increased, meaning sturdier and trouble-proof valves. Many special design valves are required.

A rather large amount of study is being placed on metals and alloys for the purpose of increasing strength and corrosion resistance. Stellited seat rings, laminated disks of asbestos and metal encased in a corrosionproof shell, and chrome steel or stainless steel disks are some of the new items.

TANKAGE

The elimination of separate or re-running operations when using a combination unit reduces the need for intermediate tankage. Thus, plant design calls for fewer and larger tanks. The character of tankage required for feed going to a polymerization or alkylation plant is

(Continued on Page 304)

ción de equipo adaptable a los nuevos procedimientos. Las piezas y revestimientos de aleaciones especiales están sobrepondiéndose a las condiciones corrosivas. Sin embargo, las altas presiones en los procedimientos de polimerización y alcalización, requieren bombas capaces de entregar material de gran volatilidad a los hornos, bajo considerable presión, y esto exige algo afuera de los ordinario, en materia de bombas. Se está construyendo una instalación que funcionará a una presión de 5000 libras en el serpentín de calentamiento, lo cual impondrá una severa carga sobre la bomba cargadora.

CONDENSADORES Y CAMBIADORES

El rendimiento de una instalación depende, en gran medida, del ahorro de calor mediante cambiadores de temperatura. Estos se construyen especialmente para mejorar la transferencia del calor y dar servicio de larga duración. Se ha dado mucha atención a los materiales que entran en la construcción de los cambiadores de temperatura, pues los gases calientes y corrosivos imponen exigencias muy grandes sobre los tubos, y varias aleaciones se están usando para satisfacer estas condiciones.

Una innovación, en materia de construcción de cambiadores de temperatura, es el reciente desarrollo de lo que se llama superficie de calentamiento de tubo de espina. En este método de construcción, es posible tener hasta 20 veces más superficie exterior de tubo, que en uno sencillo de igual diámetro. La misma cantidad de transferencia de calor puede efectuarse así con un cambiador de temperatura más pequeño, en muchos casos.

Los llamados tubos de espina se hacen labrando a máquina las espinas o estrías en la pared gruesa del tubo mismo. Las espinas puede hacerse de variables anchuras, longitudes y separación, para satisfacer las condiciones impuestas por el líquido por manejarse. Estos tubos pueden hacerse de varios metales comunmente empleados en la fabricación de cambiadores de temperatura. De interes para el refinador es el hecho de que la capacidad de los presentes cambiadores de tipo de casco y de tubo puede aumentarse sencillamente reemplazando los tubos de pared suave con los nuevos tupos de tipo de espina.

VALVULAS

Las válvulas que se emplean en las modernas instalaciones de combinación, incluyendo las de hidrogenación y polimerización, deben satisfacer muchas condiciones muy severas o exigentes. Constantemente se están aumentando las temperaturas y presiones, lo cual significa válvulas más firmes y seguras. Se requieren muchos tipos de válvulas.

Se está dedicando mucho estudio a los metales y aleaciones, con el fin de aumentar la resistencia de las válvulas a corrosión. Entre las novedades, en este sentido, tenemos asientos de acero con revestimiento de estelita, discos laminados de asbestos y metal metidos en cascos a prueba de corrosión y discos de acero y cromo o de acero inoxidable.

TANQUES

La eliminación de operaciones separadas, en conexión con una instalación de combinación, reduce la necesidades de tanques intermediarios. Por esta razón, la instalación comprende un menor número de tanques, y éstos son generalmente más grandes. El caracter de los tanques que se requieren para la alimentación de una instalación de polimerización o de alcalización, es diferente del que se usa normalmente, a causa de que la presión de vapor de semejante material es bastante grande. Se requiere, entonces, para este servicio, tanques capaces de resistir considerables presiones.

Las esferas o esferoides se emplean comunmente para servicio de alta presión. El refinador, sin instalación de polimerización, podría usar semejantes tanques para almacenar el butano producido en el verano, para su inclusión en el combustible de motor recomendado para el invierno.

Se han alcanzado varios progresos en la aplicación de varios aditamientos a los tanques, con el fin de reducir las pérdidas de vapor, cuando se usan en conexión con la producción de gasolina. Varios techos, como el flotante, el de respiradero y el de pontón, lo mismo que aislamiento especial, ciertos tipos de pintura, y aparatos para conservar el vapor, como el globo Wiggins, ayudan a reducir las pérdidas por evaporación.

TRATAMIENTO QUIMICO

La tendencia es hacia el tratamiento contínuo de la gasolina, tal como se produce en la instalación, y esto puede realizarse en la fase líquida o en la de vapor. Posiblemente de mayor importancia todavía es la remoción del azufre, lo cual produce un aumento de la susceptibilidad al plomo.

Se emplean varios procedimientos para destufar y remover el azufre. Los procedimientos que emplean el cloruro de cobre, como reagente de tratamiento, tienen aceptación general. Otros procedimientos incluyen el sulfito de plomo, plumbato electrolítico y el método Stratcoid.

Probablemente el más reciente desarrollo en el tratamiento de la gasolina en lo tocante a destufación, extracción de mercaptanes y mejoramiento de la susceptibilidad al plomo, es el procedimiento llamado "solutizer." La falla de la solución cáustica, en extraer los mercaptanes

(Continue en Pagina 304)

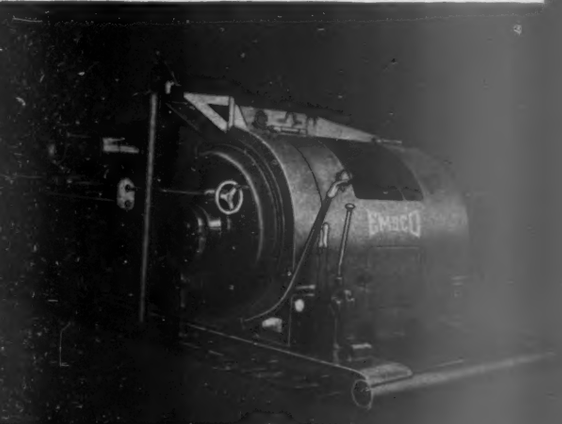
Emsco "E" Series Drawworks. Type "EA" recommended for depths to 7,500 ft., "EB" for 10,000 ft. drilling, "EC" for depths to 12,000 ft., and "ED" for any depth contemplated at present. Equipped with self-aligning bearings and pressure spray lubricated drives.

Aparejos de maniobras Emsco serie "E". El tipo "EA" se recomienda para profundidades hasta de 7.500 piés; el "EB" para perforación hasta de 10.000 piés; el "EC" para profundidades hasta de 12.000 piés, y el "ED" para cualquiera profundidad que se proyecte al presente. Equipados con cojinetes de alineación automática y transmisiones con lubricación por rocío bajo presión.

Three-engine Drilling Unit with Emsco Drawworks and Transmission, and Gardner-Denver Power Slush Pumps. This unit is exceptionally sturdy, offers unusual flexibility and has the standby reserve of three engines.

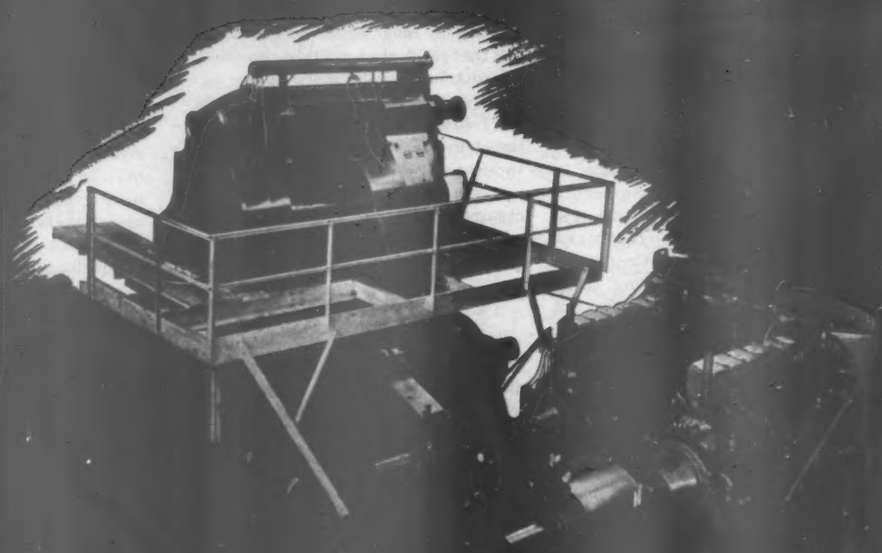
Grupo de perforación de tres motores, con aparejo de maniobras y transmisión Emsco y bombas mecánicas de lodo Gardner-Denver. Este grupo es extraordinariamente poderoso, ofrece máxima adaptación y tiene la fuerza de reserva auxiliar de tres motores.

EMSCO



Emsco Portable Drilling Units, ordinarily used to depths of 7,500 ft. are both economical and convenient to rig-up and transport. Type CA Brake and CB Equalizer contribute to smooth and safe braking. Friction clutches eliminate shock and add to ease of operation.

Grupos de perforación portátiles Emsco, usados ordinariamente para profundidades hasta de 7.500 piés, económicos y convenientes, en lo tocante a instalación y transporte. Su freno de tipo CA y su compensador de tipo CB contribuyen a la suavidad y seguridad del enfrenamiento. Los embragues de fricción suprimen el choque y a centúan la facilidad del funcionamiento.



Slush Pump Units driven by Diesel Engines and using Gardner-Denver Pumps in sizes from 7¼ x 10 to 7¾ x 20. These units are conveniently portable and thoroughly dependable.

Grupos de bombas de lodo, accionados por motores diésel, que usan bombas Gardner-Denver en tamaños de 7¼ x 10 a 7¾ x 20 pulgadas. Estos grupos son muy portátiles y muy satisfactorios.

Emsco's Drawworks and Transmission with dual Diesel engines form a compact type drilling unit. Units as illustrated above are available for all type drilling from 2,500 ft. to 12,000 ft.

Los aparejos de maniobras y transmisión Emsco, con motores diésel dobles forman un tipo compacto de grupo de perforación. Los grupos ilustrados arriba se ofrecen para perforación de 2.500 a 12.000 piés.

CONTINEN

(13) BJ Rod Elevators are operated from either front or rear.

(13) Los elevadores BJ de varillas se accionan por el frente o por atrás.

(14) The "Full Circle" Rod Elevator completely encircles the rod.

(14) El elevador "Full Circle" de varillas, se ajusta alrededor completo de la varilla.

(15) Tubing Hook for 30-ton loads.

(15) Gancho de tubería para cargas de 30 toneladas.

(16) The "75" Tubing Hook has enclosed relief spring.

(16) El gancho de tubería "75" tiene resortes de alivio tapados.

(17) Handy for picking up the rod elevator. The "20" Rod Hook has an enclosed relief spring.

(17) Muy práctico para manejar el elevador de varilla. El gancho "20" para varilla tiene un resorte de alivio tapado.

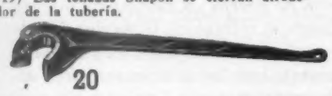
"20" Rod Hook

(18) The "50" Triplex for light loads in short derricks.

(18) El Triplex "50" para cargas livianas en torres cortas.

(19) The Snapon Tong locks around the tubing.

(19) Las tenazas Snapon se cierran alrededor de la tubería.



(20) Open End Tongs go on the tubing easily.

(20) Las tenazas de extremo abierto entran con facilidad en la tubería.

(21) BJ Extra Heavy Rotary and Casing Tong.

(21) Tenazas giratorias BJ extra pesadas para tubería.

(22) The Shortype "C" Tubing Catcher.

(22) El pescatubo Shortype "C".

(23) "Surestop" Tubing Catcher equipped with BJ Anchor.

(23) El pescatubo "Surestop" equipado con anclaje BJ.

(24) The "100" Triplex has a rated capacity of 100 tons, with a safety factor of 3, based on yield.

(24) El Triplex "100" tiene capacidad nominal de 100 toneladas, con un factor de seguridad de 3, basado en trabajo práctico.

(25) Elevator for external upset drill pipe.

(25) Elevador para tubo de perforación con recalcado exterior.

(26) A heat treated elevator for drill pipe or tubing.

(26) Un elevador tratado termicamente para tubo de perforación o tubería.

(13) The one-piece, heat-treated bodies of BJ Rod Elevators are equipped with latches which are convenient to operate from front or rear.

(14) The "Full Circle" Rod Elevator fits around full circumference of the rod.

(15) The "30" Tubing Hook has a safe "locking-arm" and is suited to use in short derricks.

(16) Tubing Hooks for 50-ton and 75-ton loads have enclosed springs, and the safe BJ Locking-Arm.

(17) The open locking-arm serves to pick up the elevator bail.

(18) This "50" BJ Triplex Hook is designed for portable drilling rigs and similar work where 50-ton loads are handled.

(19) The Snapon Tong locks around the tubing, and is strong and safe for large size tubing.

(20) The light weight Open End Tong is easily applied on the tubing, and remains in position.

(21) For safe, fast handling of drill pipe or casing, specify BJ Extra Heavy Rotary and Casing Tong.

(22) The Shortype "C" Tubing Catcher is easy to run, and extremely low in price.

(23) The "Surestop" Tubing Catcher with Anchor for setting at any desired point.

(24) The BJ 100-ton Triplex Hook has all the design and construction advantages of the larger capacity hooks. Operators like its safety, convenience and low price.

(25) The BJ Type "G" Elevator fits external upset drill pipe of 18% taper or more, without using lifting plugs.

(26) Heat-treated body, and safe design make the Type "A" Elevator an outstanding favorite.

Complete details concerning the above tools will be found in the BJ Section of the 1940 Composite Catalog and also in the individual BJ Catalog. The latter will be gladly sent to any oil man upon request . . . Addresses of conveniently located BJ offices are shown at the bottom of the opposite page.

(13) Los cuerpos de una sola pieza, tratados al calor, de los elevadores BJ de varillas, están provistos de pestillos, muy convenientes para la abertura o cierre por el frente o por detrás.

(14) El elevador de varillas "Full Circle" (de círculo completo) se ajusta alrededor completo de la circunferencia de la varilla.

(15) El gancho de tubería "30" tiene un seguro "brazo de cierre" y se presta al uso en torres cortas.

(16) Ganchos de tubería, para cargas de 50 y 75 toneladas. Tienen resortes tapados y llevan el seguro "brazo de cierre" BJ.

(17) El brazo de cierre abierto sirve para recoger el asa del elevador.

(18) Este gancho Triplex BJ "50" ha sido proyectado para uso en aparejos de perforación portátiles y trabajos similares, en que se manejan cargas de 50 toneladas.

(19) Las tenazas Snapon se cierran alrededor de la tubería. Son firmes y seguras para tuberías de gran tamaño.

(20) Las tenazas de peso liviano, de extremo abierto, se aplican con facilidad a la tubería y quedan aquí bien afirmadas.

(21) Para el manejo seguro y rápido de tubo de perforar y tubería, especifique las tenazas BJ giratorias, extra pesadas.

(22) El pescatubo "Shortype" C se maneja con facilidad y es económico en precio.

(23) El pescatubo "Surestop" con anclaje para fijación en cualquier punto deseado.

(24) El gancho Triplex BJ de 100 toneladas, tiene todas las ventajas de tipo y construcción de los ganchos más grandes. Sobresale por su seguridad, conveniencia y precio económico.

(25) El elevador BJ, tipo "G" se adapta a tubo de perforación con recalcado exterior, con 18% de conicidad o más, sin necesidad de usar tapones de levantamiento.

(26) El cuerpo tratado al calor y la construcción segura del elevador de tipo "A" hacen que este modelo sea uno los más preferidos.

En la sección BJ del Catálogo Compuesto de 1940 se dan detalles completos sobre las herramientas anotadas aquí arriba, lo mismo que en nuestro propio catálogo BJ. Ejemplar de nuestro catálogo se enviará a solicitud de toda persona del ramo que se sirva pedirlo . . . Las direcciones de las oficinas BJ, convenientemente ubicadas, aparecen al pié de la página opuesta.

quite different from that normally used, as the vapor pressure of such stock is quite high. Pressure storage is required for such service.

Spheres or spheroids are commonly used for high-pressure service. The refiner without a poly plant could use such storage in storing excess butane produced in the summer for inclusion in winter-grade motor fuel.

Progress is being made in the application of various fixtures to tanks for the purpose of reducing vapor losses when used in gasoline service. Various roofs, such as the floating, breather, and pontoon roofs, insulation, certain types of painting, and vapor-saving devices, such as the Wiggins balloon, help to reduce evaporation losses.

CHEMICAL TREATING

The trend is toward continuous treating of gasoline as made from the unit, and this can be accomplished either in the liquid or vapor phase. Of possibly even more importance, is the removal of sulfur which brings about an increase in lead susceptibility.

Several new processes are being used for sweetening and sulfur removal. The processes employing copper chloride as the treating reagent are widely used. Other processes include the lead sulfide process, electrolytic plumbate, and Stratcold.

Probably the latest development in the treating of gasoline for sweetening, extraction of mercaptans, and improvement in lead susceptibility is the so-called solutizer process. The failure of caustic solution to remove mercaptans from gasoline completely is largely due to the poor water solubility of the heavier mercaptans. Special solvents or solutizers have been found which will make great improvement in the extracting power of caustic solution. Both sodium and potassium isobutyrates have been found to be particularly good solutizers.

The general plan of treatment involves first scrubbing with dilute sodium hydroxide or tripotassium phosphate solution to remove hydrogen sulfide, and then contacting countercurrently with a regenerated solutizer solution in several stages of mixers and settlers. The spent solution passes through a stripping column and is then concentrated to its original strength in a reboiler. In order to prevent removal of alkyl phenols which act as oxidation inhibitors and leave the gasoline unstable to gum formation, both isobutyrate and alkyl phenolate salts are used in the solutizer solution.

An important development is the removal of sulfur from motor fuels by using bauxite as a catalyst. By treating gasoline or naphtha in the presence of bauxite catalyst at low pressure and relatively high temperature, a great portion of the sulfur is removed. It is reported that this method brings about an appreciable increase in octane number of the gasoline treated and a remarkable improvement in lead susceptibility. This is indicative of the present trend in treating which looks for processes that will not be so valuable in sweetening as in improvement in octane number and lead susceptibility.

Despite the introduction of several new sweetening processes, considerable quantities of gasolines are still doctor-treated. The spent doctor solution is usually reclaimed by blowing with air at elevated temperatures. A new idea is that the reclamation characteristics of the spent doctor can be improved by the use of small amounts of concentrated hydrogen peroxide in addition to the usual factors. It is claimed that a greater amount of lead oxide is recovered and that a time saving is effected.

There is a problem faced by some plant operators in disposing of spent caustic solution because of regulations against pollution. A rather novel way of solving this problem has been proposed recently and some large-scale testing carried out.

A combination-type fan mix burner is employed, using gas for fuel and atomizing the caustic solution with gas through the fuel nozzle of the burner. Flash evaporation of the caustic solution occurs and the burned caustic is deposited on a target as a powder. Such a system should dispose of the waste liquor without dumping into a waterway and possibly the recovered spent caustic might have some commercial value.

It is the universal practice to use inhibitors for the prevention of gum formation. There are several effective types sold and the choice depends on plant conditions. Appreciable traces of copper in gasoline promote oxidation by catalysis, so a deactivator has been put on the market to offset this possible condition.

AVIATION GASOLINE

The compelling factor in the development of methods for producing 100-octane number fuel is the consistently increasing requirement of aviation engines. It has been estimated that 90 per cent of the fuel used by the U. S. Army Air Corps last year was 100-octane number. Commercial air lines will be using such fuel altogether before long. The outbreak of war in Europe has heightened interest in the production of such fuel because of the advantage of fighting craft using it.

While relatively large quantities of isooctane are being produced, its volatility is such that it must be blended. The usual way of making 100-octane aviation fuel is to blend high-octane number straightrun gasoline, isooctane, isopentane, and a maximum of 3 cc. of tetraethyl lead per gallon.

Any time there should be a surplus of high-octane number gasoline over aviation needs, it could go into motor fuel. The average octane number is steadily increasing and higher octane number base gasoline

(Continued on Page 308)

de la gasolina, se debe principalmente a la escasa solubilidad en agua de los mercaptanes más pesados. Se han descubiertos disolventes o solutizeres especiales, que mejoran grandemente la fuerza extractiva de la solución cáustica. Se ha visto que los isobutiratos de sodio y potasio resultan excelentes como disolventes o solutizeres.

El plan general de tratamiento comprende, en primer lugar, una limpieza con solución diluída de hidróxido de sodio o de fosfato tripotásico, para quitar el sulfito de hidrógeno, y luego, hacer contacto, en contracorriente, con una solución regenerada de solutizer, en varios pasos o etapas de mezcladores y estabilizadores. La solución gastada pasa por una torre de destilación y es luego concentrada a su fuerza original en una caldera. Para evitar la remoción de los fenoles de álcali, que actúan como inhibidores de oxidación, y dejan la gasolina inestable para la formación de goma, se usan en la solución de solutizer sales de isobutirato y de fenolato de álcali.

Un importante desarrollo es la extracción del azufre de los combustibles para motores, mediante el uso de bauxita, como catalizador. Tratando la gasolina o nafta, en presencia del catalizador de bauxita, a baja presión y temperatura relativamente alta, se quita una gran parte del azufre. Se dice que este método produce un apreciable aumento en el número octano de la gasolina así tratada además de un notable mejoramiento de la susceptibilidad al plomo. Esto es indicativo de la presente tendencia en tratamientos, la cual no busca procedimientos desulfuradores unicamente, sino, con particular preferencia, métodos que puedan aumentar el número octano y la susceptibilidad al plomo.

A pesar de la introducción de varios nuevos procedimientos de desulfuración grandes cantidades de gasolinas se tratan todavía por el llamado método de "solución del doctor" o tratamiento con óxido de plomo. La solución gastada, por lo general, se recupera mediante soplադura de aire a elevadas temperaturas. Una nueva idea es que las características de recuperación de la solución gastada pueden mejorarse con el uso de pequeñas cantidades de peróxido de hidrógeno, en adición a los factores normales o corrientes. Se dice que se recupera una mayor cantidad de óxido de plomo, además de efectuarse un gran ahorro de tiempo.

Un problema enfrentado por algunos dueños de instalaciones es la disposición de la solución cáustica gastada, debido a los reglamentos contra la polución o contaminación. Una manera algo interesante, de resolver este problema, se ha propuesto ultimamente, y se está llevando a cabo en grande escala, por vía de ensayo preliminar.

Se emplea un quemador de combinación, de tipo de ventilador y mezclador, que utiliza gas como combustible y pulveriza o atomiza la solución cáustica con el gas, pasándola por la boquilla del combustible del quemador. Ocurre la evaporación instantánea de la solución cáustica y el material cáustico quemado se deposita en forma pulverizada sobre un recipiente a propósito. Semejante sistema pueda disponer del licor de escape, sin lanzarlo a alguna vía fluvial, y posiblemente, el material cáustico gastado podría encontrar alguna aplicación industrial práctica.

La práctica universal es el uso de inhibidores para evitar la formación de gomosidad. Actualmente se venden varios tipos efectivos y la elección depende de los requisitos o condiciones de la instalación. Los trazos o vestigios apreciables de cobre, en la gasolina, promueve la oxidación por catálisis. Para contrarrestar esta posible condición, hay ahora, a venta en el mercado, un desactivador.

GASOLINA DE AVIACION

El factor primordial en el desarrollo de métodos para la producción de combustible de número o índice octano 100, es la creciente demanda para satisfacer los exigentes requisitos de los motores de aviación. Se calcula que el 90% del combustible consumido por el Cuerpo de Aviación Militar de los Estados Unidos de América, el año pasado, fué representado por gasolina de número octano 100. Las líneas comerciales aéreas, dentro de poco, usarán también este tipo de combustible. La declaración de guerra en Europa ha intensificado el interes en la producción de semejante combustible, a causa de la ventaja que los aviones militares derivan de su uso.

La producción de isooctano es enorme, pero debido a su volatilidad limitada, es necesario mezclarlo. La manera corriente de hacer combustible de aviación de número octano 100 es mezclar la gasolina destilada de alto número octano con isooctano, isopentano y una cantidad máxima de 3 cc. de etraetilio plomo, por galón.

Todo surplus o excedente de gasolina de alto número octano, no utilizada para los fines de la aviación, puede siempre aprovecharse en la producción de combustibles ordinarios de motor. El número octano promedio está creciendo continuamente y hay mucha demanda de gasolina de alto número octano. Para satisfacer la demanda, hay necesidad de aumentar las facilidades en "cracking," reformación, polimerización y síntesis química.

COMBUSTIBLE PARA DIESEL

El creciente uso de motores diésel de alta velocidad ha significado creciente producción de adecuado combustible, entre las refinerías. La reciente terminación de una gran fábrica para la construcción de motores de este tipo, por parte de una

(Continue en Pagina 308)

IDEAL

"Reg. U. S. Pat. Off."

NO. HS-20½ ROTARY MACHINE

A heavy duty unit developed from years of rotary manufacture and field research. It is designed for all deep drilling requirements up to 15,000 feet, with unusual flexibility in rotating speeds. Spiral bevel gears provide smooth, quiet running; pinion shaft of heat-treated alloy steel forging; heavy duty ball bearings and oil bath lubrication are features that assure safe and efficient operation under the most severe drilling conditions. Gross weight, prepared for Export, 11270 pounds.

The FE-17½ Rotary Machine is a fully enclosed, oil bath unit for moderate depth drilling. The latest National features, together with many improvements not available in other rotary machines, assure quiet dependable operation. Gross weight, prepared for Export, 7773 pounds.

TABLE ROTATIVE IDEAL HS-20½

Une table pour service lourd développée par conséquence des années de fabrication et de recherche aux chantiers. Elle est dessinée pour les demandes de forage aux grandes profondeurs jusqu'à 15000 pieds, avec grande flexibilité en vitesses de rotation. Les engrenages coniques helicoidales donnent une marche silencieuse et douce; l'arbre du pignon est une pièce forgée en acier alliage à traitement thermique; les coussinets en billes et lubrification en bain d'huile assure l'opération sûre et efficace sous les conditions de forage les plus sévères. Poids brut préparé pour l'exportation 11270 livres (5120 kilos).

La Table Rotative Idéal FE-17½ est une machine entièrement enfermée, avec bain d'huile, pour le forage aux profondeurs moyennes. Les caractéristiques National les plus dernières, avec beaucoup d'améliorations qui n'existent point dans les autres tables rotatives, assure l'opération sûre et silencieuse. Poids brut, préparé pour l'exportation 7773 livres (3540 kilos).

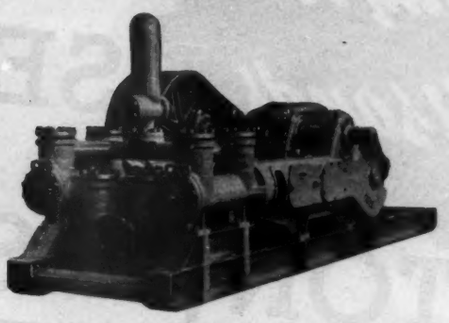
MAQUINA ROTATIVA NO. HS-20½

Máquina para servicio recio, producida después de muchos años de fabricación e investigación de máquinas rotativas. Se ha diseñado para toda clase de perforaciones hasta 15.000 piés, con flexibilidad extraordinaria en velocidades rotativas. Engranajes cónicos en espiral producen un funcionamiento suave y silencioso; eje de piñón de aleación de acero forjada bajo tratamiento térmico; cojinetes de bolas para servicio recio y lubricación en baño de aceite constituyen características que proporcionan funcionamiento seguro y eficiente bajo condiciones muy severas en los trabajos de perforación. Peso bruto, preparada para la exportación, 11270 libras.

La máquina rotativa FE-17½ es una unidad completamente encerrada en baño de aceite para los trabajos de perforación a profundidades moderadas. Las caracteristicas modernas de la National, ademas de muchos adelantos que no se encuentran en otras máquinas rotativas, aseguran un funcionamiento seguro y silencioso. Peso bruto, preparada para la exportación, 7773 libras.

IDEAL

"Reg. U. S. Pat. Off."



POWER DRIVEN SLUSH PUMPS

These pumps are made in a complete line of five sizes for varied horsepower and working pressure demands. All are ruggedly constructed to meet the severe requirements of modern drilling methods. The wide face helical gear drive is a heat-treated steel casting and is completely enclosed. Pinion shaft and crank shaft are forged from alloy steel, heat-treated and ground for maximum strength and wear. The relatively large diameter shafts and large capacity bearings reduce deflection to a minimum and insure correct alignment of gears under load. Lubrication is positive and automatic. The fluid end is highly efficient, with unusually large fluid passages and closely spaced suction valves.

These Pumps are available in the following sizes:

	Working Pressure	Gross Weight
C-350, 7¼"x18", 350 H.P.	3000 lbs.	39000 lbs.
C-250, 7¼"x15", 250 H.P.	2500 lbs.	31000 lbs.
C-150, 6¼"x12", 150 H.P.	2000 lbs.	17900 lbs.
C-100, 6¼"x10", 100 H.P.	1500 lbs.	12500 lbs.
D- 50, 5" x10", 50 H.P.	1000 lbs.	6200 lbs.

POMPES A BOUE, COMMANDE A PUISSANCE

Ces pompes sont fabriquées en cinq grosseurs pour puissances et pressions differentes. Toutes sont construites a conformer aux besoins sévères des méthodes modernes de forage.

L'engrenage helicoidale est une pièce fondue assujettie à un traitement thermique, et entièrement enfermée.

L'arbre du pignon et la manivelle sont forgées d'un acier alliage, traité thermiquement et rodé, pour puissance maximum et résistance à l'usure. Les arbres et coussinets de large diamètre réduisent au minimum la déviation et assure l'alignement des engrenages sous charge. Lubrification est positive et automatique. Le bout de décharge est très efficace, avec les passages d'échappement très grandes et les soupapes d'injection étroitement espacées.

Ces pompes sont fabriques dans les dimensions suivantes:

	Pression de Service	Poids Brut
C-350, 7.¾"x18", 350 CV	210 atm	17720 kilos
C-250, 7.¼"x15", 250 CV	175 atm	14100 kilos
C-150, 6.¾"x12", 150 CV	140 atm	8140 kilos
C-100, 6.¼"x10", 100 CV	105 atm	5680 kilos
D- 50, 5" x10", 50 CV	70 atm	2820 kilos

BOMBAS MECANICAS PARA EL LODO

Estas bombas se construyen en un surtido completo de cinco tamaños para satisfacer las diveras exigencias en potencia y presión. Todas ellas son construídos sólidamente para ajustarse a los severos requisitos de los métodos modernos en los trabajos de perforación. El mecanismo de transmisión es de anchos engranajes helicoidales de una pieza de acero fundido tratado al calor y completamente encerrado. El arbol de piñón y el eje cigüeñal son de aleación de acero forjado tratados térmicamente y esmerilados para mayor resistencia y el menor desgaste. El diámetro relativamente grande de los arboles y la capacidad amplia de los cojinetes, reducen la desviación al mínimo y proporcionan alineación correcta de las engranajes bajo carga. La lubricación es positiva y automática. El cuerpo de liquído es sumamente eficiente, con pasos extraordinariamente amplios para el liquído y válvulas de aspiración bien agrupadas.

Estas bombas se hayan disponibles en los tamaños siguientes:

	Presión de trabajo	Peso Bruto
C-350, 7¼"x18", 350 H.P.	3000 libras	39000 libras
C-250, 7¼"x15", 250 H.P.	2500 libras	31000 libras
C-150, 6¼"x12", 150 H.P.	2000 libras	17900 libras
C-100, 6¼"x10", 100 H.P.	1500 libras	12500 libras
D- 50, 5" x10", 50 H.P.	1000 libras	6200 libras

IDEAL

"Reg. U. S. Pat. Off."

34-32-9-DCU DRAW WORKS OR HOIST

The Draw Works illustrated above embodies the latest features of modern design. The unit is entirely self-contained and ready for mounting in the derrick. The unit type results in saving of time in moving and setting up and in alignments and adjustments. These Draw Works can be furnished in several sizes and capacities for drilling ranges from 2500 to 15,000 feet. The unit illustrated has a capacity for drilling from 12,000 to 15,000 feet. The drum shaft is 9" diam. and the drum 32" with Brake Rims 54" diam. by 10¾" wide. The sprockets have machine cut teeth hardened, insuring closer fit and longer life for the chain. Automatic Force Feed Pumps carry a supply of oil to all chain drives and the entire Draw Works is covered by totally enclosed or semi-enclosed Guards. The weight of this unit is approximately 30,210 lbs.

34-32-9 DCU TREUIL DE FORAGE

Le treuil de forage ci-dessus comporte les perfectionnements les plus récents. Il est livré au complet, prêt à monter sur la tour de sondage, ce qui évite les pertes de temps pour le déplacement, l'assemblage, l'alignement et les réglages. Ce treuil peut être livré en plusieurs dimensions et capacités pour forages de 2500 à 15.000 pieds de profondeur. Le treuil ici représenté permet de forer de 12.000 à 15.000 pieds. L'arbre du tambour mesure 9 pouces de diamètre. Le tambour mesure 32 pouces avec jantes de frein de 54 pouces sur 10¾" de largeur. Les couronnes à dents taillées à la machine et trempées assurent un ajustage parfait et une longue durée de la chaîne. Des pompes refoulantes automatiques envoient l'huile à toutes les commandes par chaînes et le treuil est recouvert par des gardes de protection entièrement ou partiellement encloses. Le poids de cet appareil est d'environ 30.210 livres.

NO. 34-32-9-DCU CUADRO DE MANIOBRA (GRUA)

El cuadro de maniobra ilustrado más arriba encierra las últimas mejoras de disenos modernos. El equipo es completamente unitario y se halla listo para el montaje en la torre. El tipo unitario resulta económico en tiempo del transporte y en su alineación montaje y ajuste. Este cuadro de maniobra puede ser suministrado en diferentes medidas y capacidades para perforaciones de profundidad variable de 2500 a 15000 pies. La unidad que se ilustra tiene una capacidad perforadora de 12000 a 15000 pies. El eje del tambor es de 9 pulgadas de diámetro y el tambor de 32 pulgadas con frenos de 54 pulgadas de diámetro por 10¾ pulgadas de ancho en la llanta. Las ruedas dentadas tienen dientes cortados a máquina y endurecidos por cementación, asegurando un perfecto ajuste de la cadena y una mayor duración de la misma. La lubricación de lás cadenas de transmisión se hace automáticamente mediante una bomba de presión y todo el cuadro se encuentra protegido o semi-encerrado por una cubierta protectora. El peso de la unidad es aproximadamente 30,210 libras.

THE NATIONAL SUPPLY CORPORATION

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RIVER PLATE HOUSE, FINSBURY CIRCUS & SOUTH PLACE, LONDON, E. C. 2 (Limited Liability)
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The one sure way to KNOW your oil sands...

USE THE JOHNSTON TESTER!

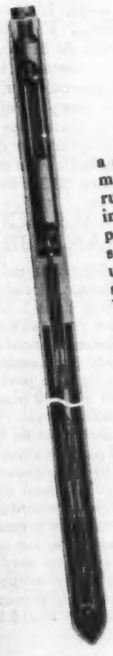
In more than twenty oil producing countries throughout the world, operators rely on the Johnston Formation Tester for accurate *formation facts* about their wells. The Johnston Tester—*without the need for setting casing*—tells exactly what every sand encountered will produce. It eliminates all guesswork, all expensive "back-tracking" and not only saves thousands of development dollars but enables operators to drill ahead swiftly, smoothly and *accurately* all the way!

Why don't you develop *your* holding along the same lines? Whether you're drilling in new areas or old, the Johnston Tester can save you money on development costs. Johnston has spent years perfecting formation testing technique . . . *and has been first with every important advancement in testing practice!*

THE JOHNSON FORMATION TESTER

Here's the tool with which you can test every potential sand in your well *under actual producing conditions!* The Johnston Tester relieves the test zone of the hydrostatic pressure of the fluid column, bails the hole dry in an instant, and opens the zone to unobstructed fluid flow. Then it traps and brings to the surface an actual sample of formation fluid for close laboratory examination. Thus, without setting a separate string of casing, you know—accurately, quickly and at nominal expense—the exact production possibilities of your sand. And by testing *each* sand this way, you can plan your completion program *in advance*, save time and money . . . *and get better results!*

Johnston Tester assemblies are available for use in either open or cased hole, and in combination to meet particular well conditions. *If desired, the tool can be furnished with all test zone equipment—including safety joint, packer, perforated anchor and even pressure recorder—made of SECURALOY, the drillable oil field metal.*



JOHNSTON BOTTOM HOLE PRESSURE RECORDER

For Complete Formation Data

The Johnston Pressure Recorder is indispensable to a *complete* formation test. It provides accurate information on well pressures at the same time the test is run, charting a clear-cut record of all pressures going in and coming out of the hole including hydrostatic pressure, flowing pressure and shut-in formation pressure as well as maximum temperature. With this valuable data you know your initial sand pressures, pressures to be considered in multiple zone completions. You also have accurate pressure figures for long-range development of the entire field. And finally, you have interpretive data on the operation of the testing tool itself.

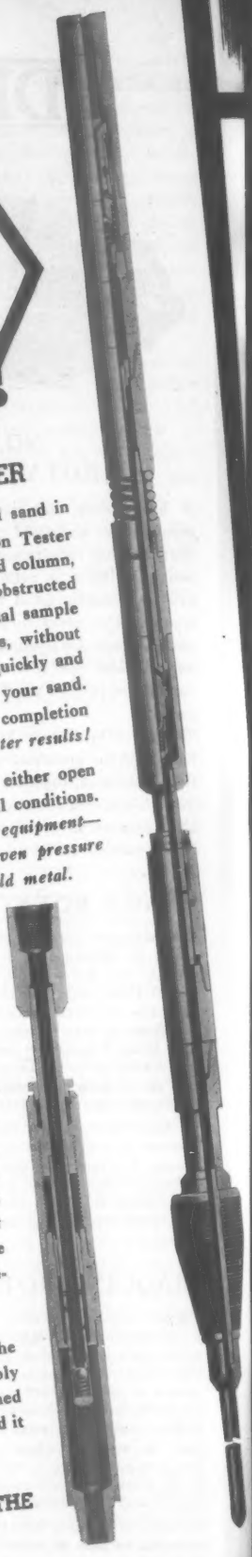
The Johnston Pressure Recorder fits into the anchor assembly of the Tester, and is fully enclosed in a fluid-tight container. Provision can be made for running the Recorder in a 4½" drill pipe anchor in open hole testing operations. The instrument can quickly and easily be converted into a Production Type Recorder for recording depth pressures in producing wells. Full details will gladly be supplied on request. The Pressure Recorder is sold outright for export only.

JOHNSTON ADJUSTABLE FLOW BEAN

Eliminates Pressure Surges

In testing high pressure formations, it is often desirable to release the formation pressure gradually into the drill pipe to prevent sudden pressure surges when the trip valve is opened. The Adjustable Flow Bean, incorporated in the testing tool below the Trip Valve, does this by relieving pressure in the test zone through a series of graduated openings which may be exposed one by one until the full opening is reached. An important feature of this arrangement is that steady flow can be maintained even though one or more of the beans become plugged.

The Adjustable Flow Bean is an accessory to the Johnston Tester, and can be placed in the tool assembly without the use of subs. Circulation can be established through the ball check on the end of the barrel should it become necessary during the test.



FOR COMPLETE INFORMATION ON THESE AND OTHER JOHNSTON TOOLS, SEE THE JOHNSTON SECTION OF YOUR LATEST COMPOSITE CATALOG.

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FORMATION AND CASING TESTING
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WHY SET CASING BEFORE YOU KNOW

Every drilling lease can cut costs with these tools!

JOHNSTON PORTABLE TOOL JOINT REFACER

Puts New Life in Your Drill String

With the Johnston Tool Joint Refacer, you can save on repair costs and bring your drilling string up to new pipe efficiency by refacing worn joints right at the rig—wherever you drill! This tool eliminates the time and expense involved in sending the pipe to the machine shop, yet brings machine shop accuracy to your rig and puts every worn box or pin in new condition again.

The Refacer mounts on a master gauge which screws onto the pin or into the box. The rotating member, driven by a geared electric motor controlled by the operator, carries the cutting tool. The amount of cut made by the tool is *automatically* determined by the master gauge—not by the operator—assuring absolute accuracy on every joint.

After refacing, the joints again make up in fluid-tight shoulder-to-shoulder contact—as good as when new. Box and pin make up in a new position, bringing formerly unused threads into play and relieving worn threads of a part of their load.

In overseas work, the Johnston Portable Refacer can effect thousands of dollars savings in upkeep costs. The tool is light, compact, yet ruggedly built to stand hard use. It can be easily handled by one man and is ready for operation by simply plugging into the nearest A.C. or D.C. socket. The tool is sold outright for export, either singly or in pairs, with all necessary gauges and fittings required.

THE JOHNSTON VIBRO-JAR

The Greatest Jar Advancement in Years!

The Johnston Vibro-Jar is built on an entirely new and revolutionary jarring principle—a principle that has not only proved practical in operation, but also *far more efficient!* This tool permits placing a steady strain on the fish—and maintaining it—while powerful upward blows loosen the fish and keep it steadily coming. The rapid vibrating action is more effective because it is *constant*, and the upward lift on the fish is *never released* while jarring—outstanding features not found in conventional type jars.

OPERATION

Here's how the Johnston Vibro-Jar operates. The tool has essentially three parts—an outer barrel that connects to the fishing tool, an inner half threaded mandrel that rotates on a large bearing assembly and connects to the drill string, and a spring-actuated hammer that delivers the blow. An upward strain on the fish is taken by raising the pipe and setting the slips or bushings in the table. (The power of the blow is independent of this drill pipe strain.) Then by rotating the drill string the mandrel threads are caused to alternately engage and disengage the threads on the striking member, thus pulling it down against the spring and then suddenly releasing it. This delivers a constant series of hard upward blows to the fish—one blow for each revolution of the pipe. *This steady upward vibration can be maintained for as long as desired until release is effected.*

Notice that *at no time* during jarring is the upward strain on the fish released, or a downward blow delivered that might cause the fish to lodge more firmly in the hole. This is an exclusive Vibro-Jar feature that greatly increases jarring efficiency!

The Johnston Vibro-Jar is under the complete control of the operator at all times and requires no heavy torque loads for efficient operation. Because the power of the blow is independent of all outside factors, the tool can be adjusted for maximum effectiveness regardless of operating conditions.

FOR MORE COMPLETE INFORMATION ON THESE AND OTHER TOOLS SEE YOUR COMPOSITE CATALOG

M.O.JOHNSTON OIL TOOLS Inc.

3117 SAN FERNANDO ROAD, LOS ANGELES, CALIF., PHONE ALbany 0186

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JOT INC.

is required. Additional cracking, reforming, polymerization, and chemical synthesis will be required to meet the demand.

DIESEL FUEL

The steady expansion in the use of high-speed diesel engines has meant increasing production of the proper fuel by the refining industry. The recent completion of a plant for making these engines by one of the large automobile companies, will probably increase fuel demands. The requirements for these engines in the way of fuel, are not simple. The problem of meeting minimum viscosity, maximum distillation point requirements, high cetane number, and low pour point, is a critical one. High-speed diesel fuel is a difficult product to make and meet all the various requirements set up.

It is impossible to produce fuels that will conform to the U. S. Army and Navy Air Corps specifications for a minimum cetane number of 55 and a pour point of —40° F., by distillation from crude oil. Only the use of dopes will permit meeting those requirements. Of various chemicals studied, it appears that the nitrates and peroxides readily satisfy the numerous requirements, and of these acetone peroxide and ethyl nitrate seem to be the best at present.

LUBRICANTS

The trend in lubricants is towards more highly refined and lighter weight oils. Factors of consumption, film strength, oiliness, wear resistance, corrosion tendencies, and others, are receiving laboratory attention. The production of lubricating oils by synthetic means is being investigated.

No new basic processes have appeared since the solvent method was developed that have found wide application and, as a matter of fact, very few solvent plants have been built recently. Refinements in established processes are being made and a number of solvents are employed.

The trend in dewaxing is toward chemical means. Such processes as those employing benzol-acetone, benzol-ketone, and ethylene dichloride as solvents are going in. Propane dewaxing, possibly accompanied by deasphaltizing and deresining, is being widely used.

A new plant recently completed uses a mixture of methyl-ethyl-ketone, benzol, and toluol blended in closely regulated percentages. The solvent-oil mix is heated to insure complete solubility of all wax. It is then cooled to precipitate the wax and filtered through vacuum drum filters where the wax is separated. The solvent is stripped from wax and filtrate for re-use in low-pressure and high-pressure flash towers.

The removal of oil from slack wax to produce finished crystalline wax has been carried out for years in the conventional sweat pan. A new idea is the Schutte emulsion deoiling process for deoiling crystalline wax.

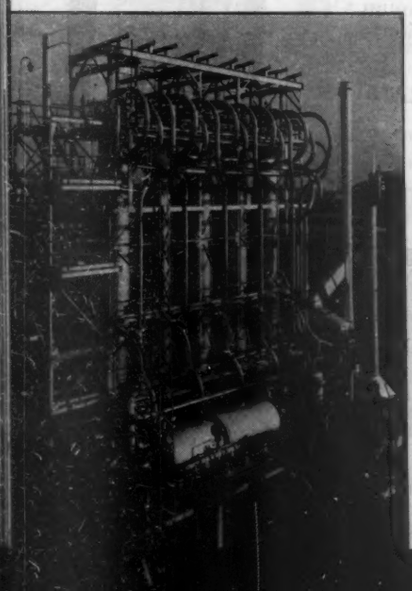
In the process, the molten slack wax is emulsified with a nonviscous, nonsolvent liquid such as water, a proportioning pump being used. The water is introduced under controlled temperature and a quantity of compressed air is fed into the emulsifier. The emulsified mixture, at the proper temperature, is fed into the separating device, consisting of a basket-type centrifugal, lined with a filter medium and operating to produce a force of 500 to 900 times gravity.

The water and oil in the emulsion are thrown out and collected in a filtrate housing. The separation may be aided by water washing at a low point in the centrifuge or a hot water wash higher up. The wax cake travels slowly up the basket, past the water-washing points and is continuously discharged.

A single-step operation will reduce the oil content by 50 to 65 per cent without the use of hot washes. To make a finished wax from slack material, the emulsified charge passes through three centrifuges in series without hot washing. The fourth machine handles the discharge and produces a finished high-melting-point wax employing hot washing. The filtrate from this machine is rerun in a fifth centrifugal for various grades of intermediate melting-point waxes. The quality of the finished wax is controlled by temperature of the water used at various points.

A great deal of work is now being done on the development of various addition agents for motor oils. A number have appeared on the market recently for which various claims are made. The publicity given to the matter of varnish or lacquer on pistons in the past year or so has accentuated this movement. Anti-lacquering and antisludging agents seem to be the most popular, although there is not a great deal of positive evidence as yet to their efficiency. Compounded diesel oils seem to be firmly established now.

The chemical trend in manufacture and the use of additives gather momentum. Oils made by the old-fashioned methods of acid treatment and filtration and undoped seem to be losing favor. Processes are being developed for the production of highly stable oils and to which will be added compounds that will keep them that way. The ultimate will possibly be a motor that is filled with such an oil at the factory and sealed, never requiring any make up or oil changing.



importante compañía de automóviles, está destinada a aumentar mucho el consumo de combustible de esta clase. Los requisitos de estos motores, en lo tocante a combustible, no son fáciles de satisfacer. Es, en efecto, bien difícil resolver el problema de viscosidad mínima, punta máximo de destilación, alto número o índice de cetano y bajo punto de congelación. El combustible de motor diésel de alta velocidad es un producto difícil de hacer, de modo que satisfaga todos los requisitos del caso.

Es imposible producir combustibles que se ajusten a las características del Cuerpo de Aviación Militar de los Estados Unidos de América, en lo tocante a un número de cetano de 55, como mínimo, y un punto de congelación de 40 grados Fahrenheit bajo cero, mediante simple destilación de petróleo. Sólo la adición de ciertas mezclas permite satisfacer estos exigentes requisitos. De las varias substancias químicas estudiadas y ensayadas, parece que los nitratos y los peróxidos satisfacen con facilidad los numerosos requisitos, y de todos ellos, el peróxido de acetona y el nitrato de etilio parecen ser los mejores, al presente.

LUBRICANTES

La tendencia en lubricantes es hacia aceites más refinados y livianos. Los factores del consumo, la resistencia de la película, la oleaginosidad, la resistencia al desgaste, las tendencias a corrosión y otras características, están recibiendo atención en los laboratorios. También se está estudiando con detención la producción de aceites por procedimientos sintéticos.

Ningún procedimiento nuevo ha aparecido desde el desarrollo del método disolvente, que tanta aceptación ha tenido, y en efecto, pocas han sido las instalaciones, basadas sobre este método, que se han construido ultimamente. Se están ahaciendo refinamientos en los procedimientos establecidos y al mismo tiempo, se están empleando varios disolventes.

La tendencia en desparafinaje es hacia medios químicos. Creciende aceptación tienen los procedimientos que emplean, con disolventes, benzol acetona, benzol ketona y dicloruro de etileno. El desparafinaje con propano, posiblemente acompañado de desalfaltación y desresinación, se emplea extensamente.

Una nueva instalación, recientemente completada, usa una mezcla de metalio, etilio, ketona, benzon y tuluol, de procentajes muy bien regulados. La mezcla es calentada, para asegurar la completa solubilidad de toda la parafina. Luego se enfría, para precipitar la parafina y se pasa por filtros al vacío, donde queda separada la parafina. El disolvente empleado se destila de la parafina y producto filtrado, para usarse de nuevo en las torres de baja y de alta presión.

La remoción del aceite de la parafina cruda o bruta, para producir parafina cristalina acabada, se ha realizado, desde hace años, en la corriente cámara sudadera. Una nueva idea es la emulsión Schutte para remover el aceite de la parafina cristalina.

En este procedimiento, la parafina bruta derretida se emulsifica con un líquido indisolvente y sin viscosidad, como el agua, empleandose una bomba dosificadora. El agua se introduce bajo temperatura regulada y cierta cantidad de aire comprimido se alimenta al emulsificador. La mezcla emulsificada, a temperatura correcta, se alimenta al aparato de separación, el cual consiste en una centrífuga de tipo especial, provista de un medio de filtración, que funciona de modo de producir una fuerza de 500 a 900 veces la gravedad.

El agua y el aceite en la emulsión son arrojados y recogidos en una caja o recipiente de líquido filtrado. La separación puede ayudarse por lavado de agua, a un punto bajo en la centrífuga, o agua caliente, en un punto más alto. El trozo de parafina sube lentamente en su canasto, pasando por los puntos de lavado con agua, y es descargado continuamente.

Una operación de un solo paso reduce el contenido de aceite de 50 a 65% sin usar lavados calientes. Para hacer una parafina acabada del material bruto, la carga emulsificada para por tres centrífugas en serie, sin lavado en caliente. La cuarta máquina maneja la descarga y produce una parafina de alto punto de derretimiento, empleado lavado en caliente. El líquido filtrado de esta máquina es pasado de nuevo en una quinta centrífuga, para producir parafinas de varios grados intermediarios de derretimiento. La calidad da la parafina acabada se gobierna por la temperatura del agua usada en los varios puntos.

Se está haciendo mucho trabajo en el sentido de desarrollar varios agentes de adición a los aceites de motor. Varios han aparecido recientemente en el mercado y todos partenden poseer ventajas evidentes. La publicidad dada a la adhesión de barniz o laca en los émbolos, el año pasado, ha acentuado este movimiento. Los agentes para evitar la adhesión de laca o barniz, y la formación de cieno, parecen ser los más populares, a pesar de que todavía no hay mucha evidencia de su utilidad práctica o positiva. Los aceites compuestos para motores diésel están ahora firmemente establecidos.

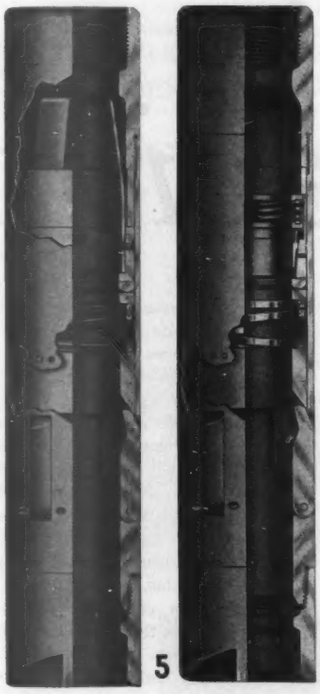
La tendencia química, en la manufactura y el uso de aditivos, sigue creciendo. El aceite hecho según los métodos anticuados de tratamiento ácido y filtración, sin uso de aditivos, parece que está perdiendo terreno. Se han perfeccionado procedimientos para la producción de aceites de gran estabilidad, los cuales, con la adición de ciertos compuestos, conservan muy bien sus propiedades originales. El resultado final parece que va ser un motor que se llenará de semejante aceite, en la fábrica, y después de cerrado, no necesitará jamás ningún otro cambio de lubricante.

SAVE YOUR INVESTMENT

Todo el dinero y tiempo que Vd. ha invertido en la perforación de su pozo podrá perderse o sufrir complicaciones más serias, si las herramientas de salvamento que Vd. emplea dejan de funcionar en debida forma. Sólo las herramientas de salvamento más seguras—sólo aquellas que han demostrado su eficacia en centenares de casos similares—son dignas de su confianza.

La Baash-Ross ha fabricado y usado herramientas de salvamento, desde hace más de veinte años. El equipo de salvamento y corte, que ilustramos en estas páginas, se está usando a diario por nuestro personal de especialistas, bajo las más variables condiciones de trabajo práctico, y nuestro departamento técnico es informado inmediatamente de toda aplicación nueva o extraordinaria que se requiere de estas herramientas. Por esta razón, las herramientas Baash-Ross de salvamento pueden efectivamente satisfacer las demandas modernas, con toda seguridad y economía. Vd. puede depender de ellas en toda emergencia.

Pídanos información completa sobre su funcionamiento, o consulte el Catálogo Compuesto, en lo tocante a descripciones ilustradas.



5

EXTERNAL DRILL PIPE CUTTER

5. Offers most rapid means of removing stuck drill pipe. Deepest cutting job ever performed (Continental Oil Co. No. 1 Proctor, Washita County, Oklahoma) was done with this cutter.

FRESA EXTERIOR PARA TUBERIA

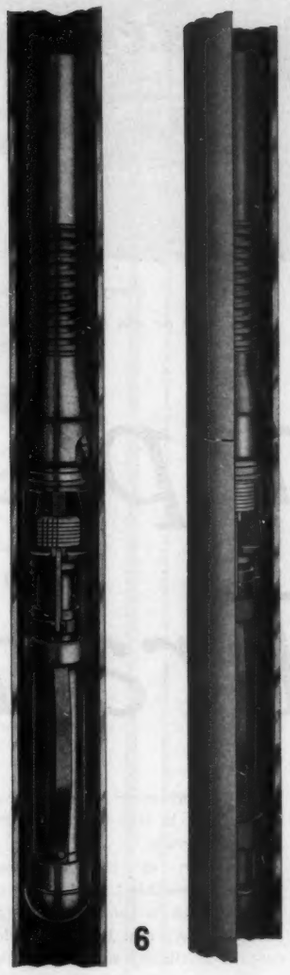
6. Se hace para cortar todo tamaño de tubería y revestimiento, y también tubo de perforación con uniones de espiga y caja de agujero completo o de interior liso. Hace varios cortes durante su descenso en el pozo.

FRESA EXTERIOR PARA TUBO DE PERFORACION

5. Representa el método más rápido de quitar el tubo de perforación atascado. El trabajo de cortar más profundo, hecho hasta ahora (No. 1 Proctor, de la Continental Oil Co., Washita County, Oklahoma) se realizó con esta fresa.

INTERNAL CASING CUTTER

6. Made for cutting all sizes of casing and tubing, and drill pipe with full-hole or internal flush tool joints. Makes several cuts during one run into the hole.



6

7

ROTARY RELEASING SOCKET

7. Readily adapted to take hold on drill pipe, tool joints, couplings, or other cylindrical objects. Withstands severe jarring. Rotates fish; packed for circulation.

MANGUITO GIRATORIO DE DISPARO

7. Se adapta facilmente a sujeción en tubo de perforación, uniones de espiga y caja para herramientas, acoplamientos y otros objetos cilíndricos. Resiste la más fuerte percusión. Gira la pieza perdida; obturado para la circulación.

ROTARY RELEASING SPEAR

8. Extremely long slips have maximum bearing area on FLAT surfaces on body. Slip setting and releasing member cannot be damaged through jarring. One body size readily adapted to catch several sizes of pipe. Made in all tubing, casing and drill pipe sizes to 13-3/8".

ARPON GIRATORIO DE DISPARO

8. Las cuñas o manguitos extremadamente largos tienen máxima superficie de contacto con las superficies PLANAS del cuerpo. La fijación del sujetador y del disparador o soltador, no puede ser alterada o dañada por la percusión. Un tamaño de cuerpo se adapta con facilidad a pescar varios tamaños de tubo. Se hace en todos los tamaños de tubería y de tubo de perforación, hasta el de 13⅜".

8

BAASH-ROSS

Carrying a section across a canyon with two tractors

Transporte de una sección por un desfiladero, mediante la ayuda de dos tratores

Transportation

Transportacion

AS a result of the large construction projects undertaken this year and advances recently made in the operation and maintenance of pipe-line systems, the present period is significant for the industry because of certain trends which definitely promise to have a widespread effect on practices to be followed in the transportation of crude oil, gasoline, and natural gas.

Pipe used today in the construction of crude-oil trunk lines is either seamless or electrically welded. For new construction, as well as for replacement of old lines, larger sizes are being employed up to 16-in. diameter.

In recent years 40-ft. joints have been extensively employed in pipeline construction. The first 50-ft. joints were furnished for part of a long line laid this summer in Illinois, Indiana, and Ohio. These longer joints effected important savings in time due to reducing the number of welds required.

There has been a definite trend toward the employment of thinner wall pipe protected by coating. Operating pressures have been increasing in a number of crude-oil, gasoline, and natural-gas lines. Pressures employed by gasoline lines are frequently considerably in excess of 1,000 lb. In building a 442-mile line in Wyoming and Utah, completed this fall, it has been necessary to provide for starting oil through the line at 1,200 lb. pressure because of high static head in line traversing mountainous terrain.

Operation at higher pressures makes it possible to pump for greater distances without changing the rate of flow; and it also provides a certain flexibility which permits the utilization of facilities to a fuller extent. The distance between pumping stations may be lengthened and investment in extra lines and relay stations for temporary conditions may be reduced.

CONSTRUCTION METHODS

In preparing to lay a trunk line, the industry has made it standard practice to employ aerial surveys to assist in locating the right-of-way. In locating the route for a line laid through mountainous country, the engineers of a major company were confronted with the necessity of choosing between two routes which were available for crossing a certain range. After a few hours spent in reconnoitering the situation from the air, they were able to reach a decision which would have been delayed several days if they had attempted to do this work entirely on the ground. After aerial reconnaissance, orders were given for photographing the route which the line was to follow.

The increased speed with which

COMO resultado de los grandes proyectos de construcción, emprendidos este año, y de los progresos realizados recientemente en el funcionamiento y la conservación de sistemas de líneas de tubería, el período presente es significativo para la industria, a causa de ciertas tendencias que prometen definitivamente tener un efecto sensible sobre las práctica por seguirse en el transporte del petróleo crudo, gasolina y gas natural.

La tubería que se usa hoy en día en las líneas principales es del tipo sin costura o del tipo soldado por electricidad. Para las nuevas construcciones, lo mismo que para la renovación de las líneas antiguas, se están empleando tamaños más grandes, hasta de 16" de diámetro.

En años recientes, se han usado mucho, en la construcción de líneas, los tubos de 40 piés. Los primeros tubos de 50 piés fueron suministradas para una parte de una larga línea de tubería extendida este verano en los estados de Illinois, Indiana y Ohio. Estas uniones a tubos más largos introducen, con el tiempo, economías importantes, debido a que reducen el número de soldaduras requerido.

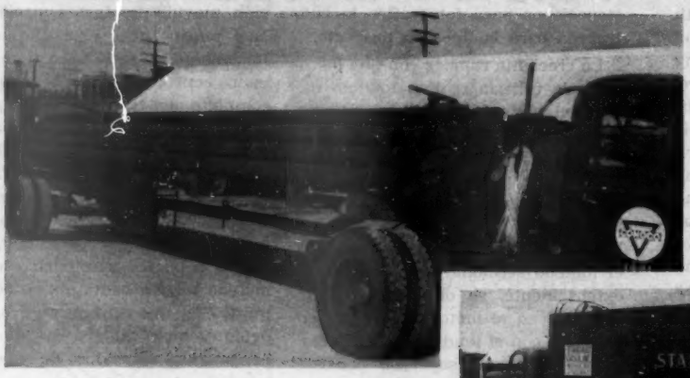
Ha habido una tendencia definida hacia el empleo del tubo de pared delgada, protegido por capa. Las presiones de trabajo han sido aumentadas en varias líneas de tubería de petróleo crudo, gasolina y gas natural. Las presiones que se emplean en las líneas de gasolina son, a menudo, superiores a 1000 libras. En la construcción de una línea de 442 millas, en los estados de Wyoming y Utah, completada el otoño pasado, fué necesario proveer una presión de partida de 1200 libras, debido a la resistencia estática de la línea en su trayecto por regiones montañosas.

El trabajo a mayores presiones permite impulsar el líquido a más largas distancias, sin cambiar la velocidad de la corriente, y provee, también, cierta flexibilidad, que hace posible utilizar las facilidades, en toda su capacidad. La distancia entre las estaciones de bombas puede alargarse y la inversión en líneas adicionales y estaciones auxiliares, para condiciones temporarias, reducirse, también, mucho.

METODOS DE CONSTRUCCION

En la preparación de un proyecto de línea de tubería, la industria ha establecido, como práctica corriente, el reconocimiento o estudio aéreo, como ayuda para determinar o ubicar el derecho a la vía. En la ubicación de la ruta para una línea tendida por regiones montañosas, los ingenieros de una importante compañía se vieron obligados a elegir entre dos rutas disponibles para pasar cierta sección en la montaña. Después de unas pocas horas de estudios aé-

"SELLING GOODS THAT WON'T COME BACK —TO CUSTOMERS WHO WILL"



● *Left:* Pole trailer

● *Below:* Semi trailer

Has been called Salesmanship. A better explanation would be a Good Product and Satisfied Customers. Let's emphasize this. For 24 Years Spencer has specialized in exclusive manufacture of trailers for every type of hauling in the oil industry. This is your assurance, when you order Spencer Trailers, of receiving equipment that has been designed and built with years of experience in knowing what you require for your service.

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Esto describe aptamente el arte de vender. Otra manera de expresar esta idea es: un buen producto significa clientes satisfechos. Permítanos dar énfásis a ésto. Durante 24 años, la compañía Spencer se ha dedicado con especialidad a la fabricación de remolques o vagones acoplados para todo tipo de transporte que se presente en la industria petrolera. Esta es su mejor garantía de que al comprar Ud. remolques Spencer recibirá el equipo que ha sido especialmente estudiado y construído con muchos años de experiencia y conocimiento de lo que Ud. necesita para su servicio.

Hay un remolque Spencer para todo tipo de transporte. Pídanos información detallada.

● *Above:* 4 wheel trailer

● *Above:* Pole trailer

● *Left:* Semi trailer

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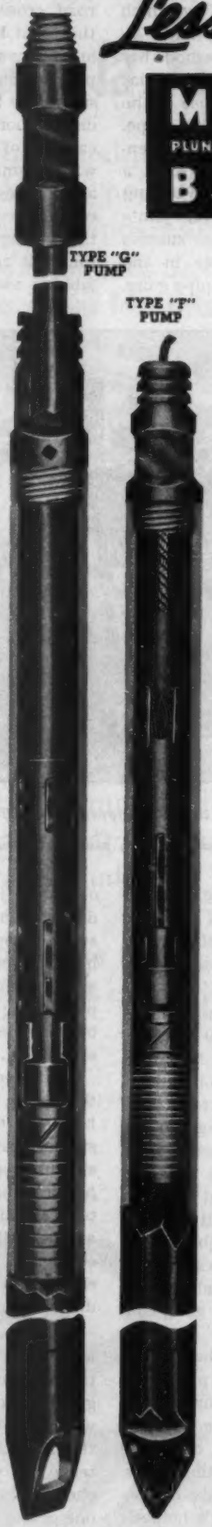

Time saved is money made . . . which is exactly what the Midco Bailer does for every operator who puts it to work. Recent improvements make the Midco Bailer even faster, safer and more efficient, and that's saying a lot for a product that has won a host of friends the world over.

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Patent Nos. 2061489, 2090055, 2090209, 217623 —others pending

●

El tiempo ahorrado es dinero ganado . . . y esto es exactamente lo que el achicador Midco hace para todo dueño que lo pone a trabajar. Gracias a recientes refinamientos, el achicador Midco es aun más rápido, seguro y eficaz, y esto es, en realidad, decir mucho, en beneficio de un producto que se ha captado la preferencia de muchos dueños en todas partes del mundo.

Ensayado y comprobado bajo las más severas condiciones de trabajo, tanto en los campos petrolíferos nacionales como en los del extranjero, el achicador Midco es una herramienta de admirable adaptabilidad, que permite a los dueños rehabilitar sus pozos, sin consideración de sus condiciones, en un mínimo espacio de tiempo.

El achicador Midco resarce su propio precio en el primer trabajo. Obtenga los datos completos que aparecen en el Drilling Equipment Directory (advirtiendo que los precios presentes son más bajos que los anotados en esta guía) o escríbanos directamente. Se puede obtener por medio de todas las firmas abastecedoras del ramo.

PARA ARRIENDO O VENTA

Patentes Nos. 2061489, 2090055, 2090209, 217623 y otras en trámite.

Midco Bailer Co.

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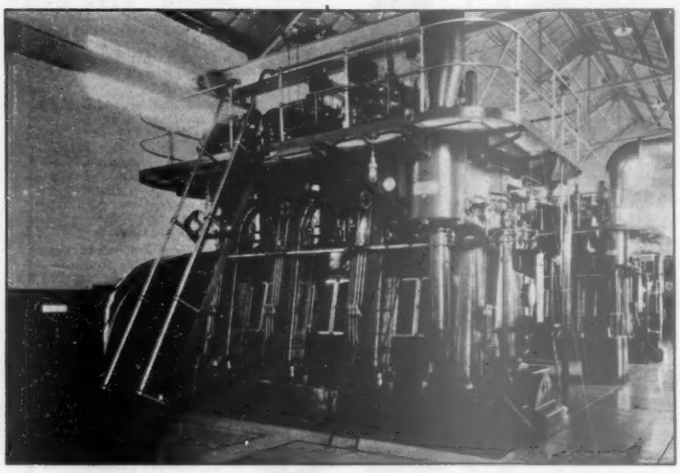
Export Representative

Acme Well Supply Co., 19 Rector St., New York, N. Y.

pipe lines have been laid during the past year may be credited to a large extent to the efficient modern equipment developed by manufacturers and to the close attention given to organizing the procedures by which work is handled in the field. Although the firing-line method has been extensively employed, there has been a steadily increasing use of the stovepipe method of laying pipe. Since the stovepipe method is essentially one of adding one joint at a time to the line instead of adding pipe in sections of several joints welded together, the key to success in setting a fast pace lies in the proper organization of the pipe gang.



Main-line pumping station equipped with 750-hp. diesel engines

Estación de bomba de línea principal, provista de motores diésel de 750 cdf.

To show how such an organization functions, the operation of one contractor, who used the method successfully this year, serves as a good example.

This contractor used one tractor, a welding machine, and 19 men for the pipe gang at that time. However, on certain other contract jobs undertaken this year, two tractors have been used by the pipe gang. On the job described here the tractor picks up a joint from the skids over the ditch. It is lined up and held in place by a clamp, while it is tack-welded by two tackers, each of them working on opposite sides of the pipe at the same time. In addition to these two tackers the pipe gang consists of a foreman, tractor operator, stabber, two clamp men who put the clamps in place on the pipe, two men who carry clamps forward so they may be ready for use, two bar men, two swab men who clean the joints, two men for handling skids, two extra men to take care of special situations, two welder's helpers, and a truck driver for the welding machine. Following the pipe gang came two welders who ran stringer beads; these were folowed by 10 bell-hole welders with their helpers. The pipe gang was preceded by the bending gang. With stove-piping operations organized in this way, 12,000 to 16,000 ft. per day were laid with one main-line gang. Records kept over a 20-day period show that the organization described averaged 2½ miles per day.

Although most highway and railroad crossings are still made with the hand boring method, employing an auger turned by men operating pipe tongs, this year satisfactory results have been obtained with power-driven boring equipment which is capable of completing boring work with a smaller expenditure of time and money. Some contractors who rely entirely on manual labor for the boring work at crossings have found it advisable to resort to the jabbing method, which uses a gang of men to jab the hole with a cutting device that in shape resembles a sugar scoop. This has been found to have advantages where inexperienced common labor must be employed for this work which cannot be depended on to handle pipe tongs effectively.

In the construction of trunk lines this year, the prevailing practice has been to coat and wrap pipe by special traveling equipment. A considerable amount of pipe on major projects has been coated with asphalt-mastic coating, applied either at the rail head or with traveling equipment on the right-of-way, according to the requirements of conditions.

Various policies have been followed this year for determining the tightness of new lines. It has been generally observed there has been a wider use of testing equipment in the field in order that the competence of welders may be quickly checked. In the specifications for one of the longest crude-oil lines laid this year, provision was made for applying a 1,000-lb. water test. However, as the result of close supervision of the welding, the company was confident that the line was tight and oil was run into the line without a pressure test. Another company, which has just completed a line several hundred miles long,

reos, llegaron a una decisión final, que les habría consumido varios días de trabajo, si hubieran tratado de hacerla desde el suelo. Después de este reconocimiento aéreo, dieron instrucciones para fotografiar la ruta trazada para la línea en proyecto.

La creciente rapidez con que las líneas de tubería se han tendido durante el año pasado, se debe, en gran medida, al eficaz equipo moderno que los fabricantes han perfeccionado, y a la prolija atención que se da a la organización de los procedimientos con que se manejan los trabajos en el campo. A pesar de que el método seccional se ha empleado extensamente, se observa creciente progreso en el método separado, en conexión con el tendido de las líneas. Como el método separado consiste en añadir un tubo o unión, cada vez, a la línea, en lugar de agregar secciones que constan de varios tubos soldados, cada vez, el secreto del éxito en hacer el trabajo con máxima rapidez está en organizar efectivamente los movimientos de la cuadrilla de trabajadores. Para mostrar cómo funciona semejante organización, citaremos, como ejemplo típico, el caso de un contratista, que siguió con éxito el método de instalar separadamente cada tubo o unión.

El contratista usó un tractor, una máquina de soldar y una cuadrilla de 19 trabajadores, en uno de sus trabajos. En otro trabajo, hecho también este año se valió de dos tractores. En el trabajo que describimos aquí, el tractor recoje el tubo de los patines sobre la zanja. El tubo se pone en línea y se sujeta en su punto por abrazadera. Dos hombres se encargan de unirlo por soldadura, uno a cada extremo, trabajando al mismo tiempo. En adición a estos dos hombres, que se encargan de la soldadura, la caudrilla incluye un capataz, un conductor de tractor, un señalador (stabber), dos hombres para colocar las abrazaderas en su sitio en el tubo, dos hombres que llevan las abrazaderas al punto en que se necesitan, dos hombres con palanca o barra, dos hombres para limpiar los tubos, dos hombres para manejar los patines, dos hombres para trabajos imprevistos, dos ayudantes de soldador y un conductor de camión para la máquina soldadora. Siguiendo a la cuadrilla anterior vienen dos soldadores, que hacen las juntas en las pestañas y a continuación, dos soldadores más, con sus ayudantes, que completan el trabajo. La cuadrilla encargada de tender la tubería ha sido precedida por otra que se encarga de doblar y alistar los tubos. Con el trabajo organizado sobre esta base, se puede extender al día un total de 12.000 a 16.000 piés, con una sola cuadrilla. Según los registros llevados por la organización, que aquí citamos, se ve que el promedio diario fué de 2½ millas.

A pesar de que la mayor parte de los cruces de caminos y líneas férreas se hacen todavía por el método de perforación manual, empleando una barrena accionada por hombres, con la ayuda de tenazas de tubo, este año se empleó con resultados satisfactorios, un equipo de perforación, movido por fuerza mecánica, el cual puede hacer el agujero económicamente en muy poco tiempo. Algunos contratistas, que dependen por completo, del trabajo manual para la perforación de agujeros debajo de cruces, han visto conveniencia en valerse del método de "excavación," el cual aprovecha una cuadrilla de trabajadores para abrir el agujero con una máquina cortante, que en forma se parece a un cucharón. Este método resulta ventajosa en aquellos puntos en que no hay obreros competentes para hacer el trabajo de perforación, valiéndose de tenazas de tubo.

En la construcción de líneas importantes este año, la práctica predominante ha sido dar al tubo una capa de material especial, con la ayuda de un equipo mecánico móvil a propósito. Una gran extensión de tubería, en importantes proyectos, ha sido tratada con revestimiento de cemento de asfalto, en la estación de entrega, o con equipo de revestir, en la misma obra, según hayan sido los requisitos del trabajo.

Varios métodos se han sequido este año para determinar la impermeabilidad de las nuevas líneas. Por lo general, se ha observado que ha crecido el uso de instrumentos de ensayo, en los trabajos, para verificar la competencia de los soldadores. En las especificaciones de una de las líneas de tubería de petróleo más largas de las tendidas este año, se incluyó la ejecución de un ensayo hidráulico a 1000 libras de presión. Sin embargo, en vista del cuidado extremo que se dió a la soldadura, la compañía tuvo confianza en la obra ejecutada y lanzó el petróleo por la línea sin hacer ningún ensayo de presión. Otra compañía, que acaba de completar una línea de tubería de varios centenares de millas de longitud, ha seguido la práctica de ensayar la línea con presión neumática, en secciones que varían en longitud entre media milla y cinco millas. Antes del ensayo, se corre por la sección un limpiatubos de construcción especial, provisto de discos de caucho, con la ayuda de aire comprimido suministrado por el compresor del contratista. De esta manera se quita toda la tierra, partículas de soldadura, etc. En anteriores trabajos de construcción, esta misma compañía ha pasado el limpiatubos por cada serie de tres o más tubos soldados, antes de colocarla en la línea. El pasar el limpiatubos por las secciones más largas. mediante aire comprimido, ha resultado más conveniente, por el tiempo que ahorra. A continuación de esta limpieza, se tapan ambos extremos de la sección larga y se le aplica una presión neumática de 100 libras, durante 24 horas. Si los manómetros acusan que ha bajado la presión, durante este

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The language used by any operator to describe his supply and equipment needs is the language that best describes the facilities of the Frick-Reid Supply Corporation in that area.

What the oil man needs we make a point of having, whether in New York or New Mexico, in the Illinois Basin or on the Gulf Coast, in the States or on the Caribbean.

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Ningún lenguaje es extranjero para la Frick-Reid

El lenguaje que cualquier interesado emplea para describir lo que necesita, en el sentido de abastecimientos y equipos, es el lenguaje que mejor describe las facilidades de la Frick-Reid Supply Corporation en su localidad.

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Nombres de fabricantes de fama internacional se presentan esculpidos en la base del servicio Frick-Reid. La organización Frick-Reid ofrece sólo productos de Superior Calidad. Ningún campo está demasiado alejado, ningún depósito o representante de la Frick-Reid está demasiado aislado, para la inteligente solución de los problemas pecualires a la región del caso.

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has made a practice of testing the line with air pressure in sections varying in length from a half mile to 5 miles. Before testing, a specially constructed swab with rubber disks is blown through the section by compressed air furnished by the contractors' compressors. Dirt, welding icicles, and small animals are removed in this way. In previous construction work, this company had pulled a swab through each stalk of three or more welded joints before it was tied into the line. Blowing the swab through the longer sections was found to be advantageous because it saved time. After the long sections had been blown in the manner just described, both ends were closed and held under 100 lb. of air pressure for 24 hours. If gages showed that pressure had declined during this time, the contractor was required to locate leaks and make necessary repairs.

CRUDE-OIL PIPE LINE OPERATION

In the operation of pipe lines, a number of important changes in practices have been brought about by the efforts of superintendents and engineers and the manufacturers of equipment.

Diesel engines made for pumping stations show the modern trend toward lighter weight and higher speed. Modern diesel engines are delivered by truck and installed at pumping stations as units instead of being assembled. In the Illinois fields as large a unit as a 900-hp. diesel engine was transported from the railroad to the station by truck in the course of a pipe-line expansion program which has been carried on there. Experiments conducted recently with supercharging equipment have shown that this is capable of increasing the horsepower of pipe-line engines.

Two successful innovations have been introduced to facilitate communication where stations are not connected by telegraph or telephone lines. A line on the Gulf Coast has devised a scheme by which simple signals may be transmitted to the next station upstream by closing the gate on the suction line in such a way as to put a V or a W on the pressure chart of the station above. These stations are equipped with centrifugal pumps driven by gas engines. Another company has been able to use a pipe line instead of wire for telephoning from one station to another.

Simplification of gathering-line systems has been accomplished by eliminating tanks and heavy pumping equipment and by utilizing light equipment, meters, closed systems, and, in some localities, semiautomatic control.

Equalizing the pumpings and receipts at a trunk-line station may be done by varying the speed of the pumping machinery through a hydraulic attachment on the governor of the engine, which is actuated by the pressure in the crude-oil suction system.

Displacement-type meters provide a reliable means for checking field receipts and dispatching oil. Furthermore, this type of meter used with a rate-of-flow recording instrument can be used as a sensitive means for determining small losses of oil between two pumping stations.

Differential-type instruments such as orifice and venturi-type meters can be used to advantage in determining for dispatching purposes the volume of oil delivered by centrifugal pumps, indicating whether a pressure drop at a pumping station means a line failure or trouble in the pumps, determining where a line failure has occurred when pumping by one or more relay stations, and learning on what line a failure has occurred when oil is being delivered from a common source through several lines.

A pressure-regulating valve installed between the receiving tank and incoming lines at a station insures a desired pressure on the suction system and does away with inadequate filling of discharge pumps.

It has been found to be practicable to use duplex or triplex pumps for pumping separately different grades of crude or to use different-size plungers for proportioning a mixture of two different crudes for the purpose of reducing the viscosity. This facilitated pumping the composite mixture.

UNIQUE PROCEDURES

Compressed air has been used successfully in conjunction with synthetic-rubber disks for displacing oil from lines which are to be removed from active service.

Compressed air has been used effectively on a gasoline line where it has proved to be a quick and satisfactory means for emptying lines when changes and repairs are to be made. In displacing gasoline from a line in this way, it has been found to be important that operations be carried on in several steps or stages in order to have the line divided into sections of reasonable length to facilitate the ejection of fluid. In each of these sections the compressor should be located at the highest point where it is practicable for work to be done.

At the outset 2-in. extra-heavy couplings are welded at each point where the air compressor is to be connected. Full air pressure of 140 lb. per sq. in. is built up on the line before opening the bulk station or refinery valves at points where gasoline ejected from the line is to be received. By building up the pressure first, it is found there is less gasoline left in the line after ejection. The dangerous part of the operation comes when air pressure is released. However, by running a flexible hose from each of the 2-in. couplings to a tank truck or into drums, danger is lessened.

tiempo, el contratista queda obligado a ubicar los escapes y hacer las reparaciones necesarias.

FUNCIONAMIENTO DE LA LINEA DE TUBERIA DE PETROLEO CRUDO

Al funcionamiento de las líneas de tubería de petróleo crudo, se han introducido varios cambios importantes, resultantes de los esfuerzos de los superintendentes e ingenieros de las compañías de petróleo y de la cooperación de los fabricantes de equipo.

Los motores diésel, construídos para estaciones de bombas, reflejan la moderna tendencia hacia peso más liviano y velocidades más altas. Los modernos motores diésel se entrengan por camión y se instalan en las estaciones de bombas, como grupos completos, listos para funcionar. En los yacimientos de Illinois se ha visto el caso de un diésel de 900 cdf., que fué transportado de la estación del ferrocarril a la estación de bombas, en un camión que a la sazón se utilizaba en trabajos de tender una línea de tubería suplementaria. Los experimentos emprendidos recientemente, con equipo supercompresor o sobrecargador, han mostrado que éste es capaz de aumentar la fuerza motríz de las máquinas empleadas en la línea de tubería.

Dos satisfactorias innovaciones se han introducido para facilitar la comunicación en aquellos casos en que las estaciones no están conectadas por telégrafo o teléfono. Una compañía en la Costa del Golfo ha ideado un método para transmitir, por intermedio de la línea de tubería, a la estación siguiente a nivel más alto, señales sencillas, cerrando la válvula en la tubería de aspiración, de modo que este movimiento llega a trazar una V o W en el registro de presión de la estación llamada. Estas estaciones tienen bombas centrífugas, accionadas por motores de gas. Otra compañía ha logrado utilizar una línea de tubería, en lugar de alambre, para la comunicación telefónica entre una estación y ótra.

La simplificación de las líneas de captación o alimentadoras se ha obtenido por la eliminación de tanques o dispósitos y pesado equipo de bomba, y por la utilización de equipo liviano, contadores, sistemas cerrados y en algunas localidades, por gobierno o control semiautomático.

La regulación de las entradas y las salidas en una estación de línea principal puede hacerse variando la velocidad de las bombas, por medio de un aditamiento hidráulico, que se instala en el regulator del motor, el cual es accionado por la presión en el sistema de aspiración del petróleo crudo.

Los contadores de tipo de desplazamiento representan un medio seguro para verificar los recibos y entregas de petróleo. Por otra parte, este tipo de contador, usado con un instrumento registrador de velocidad de corriente, puede también usarse como un medio muy exacto para determinar las pequeñas pérdidas de petróleo entre dos estaciones de bombas.

Los intrumentos de tipo diferencial, como los contradores de orificio, en general, pueden emplearse ventajosamente para determinar, para los fines de entrega o despacho, la cantidad de petróleo entrega por las bombas centrífugas. En este caso, estos instrumentos indican si la caida de presión en una estación de bombas significa falla de tubería o irregularidad en las bombas, determinan dónde ha ocurrido falla de tubería durante el trabajo de una o más estaciones auxiliares y señalan en qué tubería ha ocurrido falla cuando está pasando petróleo por varias tuberías, proveniente de una fuente común.

Una válvula reguladora de presión, instalada entre el depósito receptor y las líneas de entrada, de la estación, establece conveniente presión en el sistema de aspiración y evita la carga inadecuada en las bombas de descarga.

Se ha visto que es práctico el uso de bombas dobles o triples para el manejo de tres diferentes clases de petróleo crudo o el empleo de émbolos de diferentes tamaños para proporcionar una mezcla de dos diferentes clases de petróleo crudo, para reducir la viscosidad. Esto facilita el bombear la mezcla.

PROCEDIMIENTOS SINGULARES

El aire comprimido se ha usado con éxito, en cominación con discos de caucho sintético, para quitar el petróleo de las líneas de tubería que se descartarán del servicio activo.

El aire comprimido se ha utilizado efectivamente en una línea de tubería de gasolina, donde ha resultado muy rápido y satisfactorio para vaciar los sistemas cuando éstos necesitan alteraciones o reparaciones. Al quitar la gasolina de una línea de tubería, de esta manera, se ha visto que es importante hacer el trabajo en varias etapas, a fin de dividir la línea en varias secciones de longitudes adecuadas, para facilitar la eyección del líquido. En cada una de estas secciones, el compresor debe colocarse en el punto más alto en que resulte posible y práctico hacer el trabajo.

Al principio, se soldan acoplamientos bien pesados de 2 pulgadas, en el punto donde se va a conectar el compresor de aire. Una completa presión neumática de 140 libras por pulgada cuadrada se desarrolla en la línea antes de que se abran las válvulas de la estación receptora o de la refinería, donde ha de recibirse la gasolina eyectada de la línea. Desarrollando primero la presión, se ve que queda menos gasolina en la línea después de la eyección. La parte peligrosa del trabajo se presenta cuando se quita la presión neumática. Sin embargo, corriendo una manguera flexible de cada uno de los acoplamientos de 2" a un camión tan-

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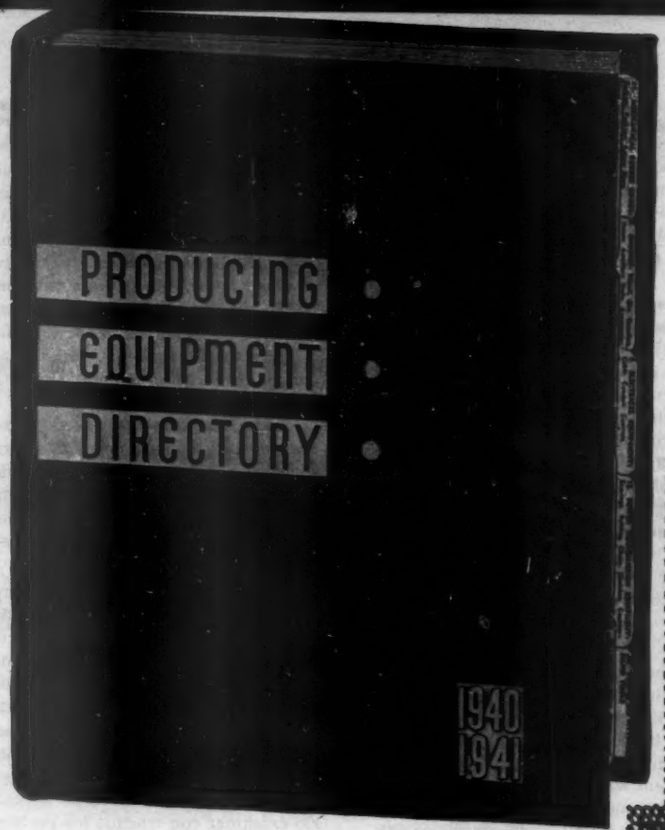

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In carrying on an operation of this kind a static bonding cable is placed across points of the proposed operation. The line is cut with hacksaw. Mechanical vapor-sealing pack is placed in each end of an open line. After flanges are welded into the line at the proper spacing, mechanical vapor-sealing packs are removed and valves are placed between the flanges and bolted securely; steel bull plugs are placed in the 2-in. couplings welded on the line and one electric bead is run on top. The line is pressure-tested with gasoline before normal operations are resumed.

Another method for preparing to cut into a line has been developed this year on another gasoline line. This makes use of a plug scraper capable of sealing off against pressure heads as great as 115 ft. These plugs were fabricated of conventional rubber-disk scraper parts. To use plug seals safely it is necessary that accurate profiles of the traverse of the line be examined to note the location of gate valves on either side of the point where the cut is to be made and for plotting the static head at this point. This valve governs the number of plugs that should be run to seal off the head of fluid which must be dealt with. By careful control, proper timing, and telephonic communication between men at the gate valves it is possible to stop the plug within a few feet of the predetermined point. Instead of draining several hundred barrels such an operation may entail the draining of less than 1 bbl.

MAINTENANCE OF LINES

Maintenance of the lines is a major concern of the industry. During the past 10 years great progress has been made in the protection of pipe against corrosion. This year the attention of the industry has been attracted to two developments which provide effective means for locating trouble. Aerial patrol is being used as an economical means for detecting leaks in lines. A water-pressure testing method has been used for locating sources of potential trouble. Consideration will be given to these separately.

AERIAL PATROL

An aerial patrol has been established on 2,500 miles of crude-oil and gasoline pipe lines in the Mid-Continent area, which have been handled as two routes, each of which is patrolled in a week. Patrolling is done by a pilot who is equipped with two planes with cruising speeds between 90 and 100 m.p.h. Intermediate landing points are provided along the routes; as a result planes are seldom in the air for more than two hours at a time. The schedule has been arranged so the planes are used alternately; this makes it possible to have one plane at a central airport for maintenance work and emergency use.

It has been found that leaks can be quickly and accurately spotted from the air. A patch of crude oil on the ground shows up distinctly as a jet-black spot against a green or brown background. By special permission from the Civil Aeronautics Authority, pipe-line patrol planes are permitted to fly between 300 and 500 ft. above the ground. The pilot makes a practice of watching the ground 100 ft. ahead of the plane. Signaling between the plane and pumping stations is carried on by ground panels and dropped signals. The cost of air patrol appears to be about half that of the conventional method. Planes patrol from 400 to 600 miles of line a day. They use 73-octane aviation gasoline and get about 20 miles to the gallon. Aerial patrol has a further advantage in that it offers a means for maintaining extra supervision over portions of the line that may be subject to unusual conditions.

WATER-PRESSURE TESTS

The problem of locating or "prospecting" for hot spots, which should be repaired before they give trouble, has been attacked by the general superintendent of a major pipe-line system who has employed the water testing method on old lines. Since it has been found from experience that on most lines the sections needing repairs or replacement are only a small percentage of the whole line, it has been recognized that the cost of prospecting for hot spots had been much higher than seemed to be necessary. The water-pressure method has proved to be effective in finding the weak points on pipe lines. By repairing before trouble occurs it has been possible to avoid expense from large oil losses and attendant damage costs. By this method pipe is tested in sections of convenient lengths.

Equipment used for handling water and for pressure purposes has consisted of spare oil pumping units at stations, spare tankage or old tank dikes and reservoirs for water storage at pump stations, portable two-stage centrifugal pick-up units; portable rectangular steel tanks of about 40 bbl. capacity each; indicating pressure gages and recording pressure gages, line scrapers and go-devils, and various sizes of lubricated plug stops. Different pressures have been used for different kinds of pipe; pressures above 1,000 lb. have been frequently applied.

DETECTING GASOLINE LEAKS

In California a method has been devised for detecting leaks in transporting natural gasoline. It consists of conducting regular pressure tests of the system. Since the conventional gate valve will not close positively tight against natural gasoline under high pressure, positive shut-off valves have been installed at intervals of 2 to 10 miles. In preparing for a pressure test recording pressure gages are installed in each section between the positive shut-off valves in order that a record of the pressure in each section may be obtained. It is important that no gas pockets be in the line when the test is made. Pressure is raised to 500 lb. and held at that point by closing the necessary gates.

que o a tambores, se modera el peligro.

Para hacer el trabajo, se pasa un cable de conexión estática por puntos de la operación propuesta. La tubería se corta con una sierra. Una empaquetadura mecánica, hermética al vapor, se coloca en cada extremo de la tubería abierta. Después de soldadas las pestañas en la tubería, a correcta distancia, se quitan las empaquetaduras mecánicas herméticas al vapor, y entre las pestañas o bridas se aseguran bien las válvulas, con pernos; tapones ciegos de acero se colocan en los acoplamientos de 2" soldados en la tubería. La tubería se somete a ensayo de presión, con gasolina, antes de emprenderse de nuevo la operación normal.

Otro método de preparación, para cortar la tubería, fué desarrollado este año para otra línea de tubería de gasolina. Este método se vale de un raspador de tapón, capaz de cerrar contra una presión hasta de 115 libras. Estos tapones se fabrican de piezas corrientes de raspador de disco de caucho. Para usar con seguridad cierres de tapón, es necesario examinar con cuidado los perfiles transversales de la tubería, para tomar nota de la ubicación de las válvulas de compuerta, en cada lado del punto donde se va a hacer el corte y para calcular la fuerza estática en este punto. Esta válvula gobierna el número de tapones que deben correrse para cerrar la presión del líquido presente. Mediante cuidadose gobierno, acertada coordinación de tiempo y comunicación telefónica entre los hombres en las válvulas de compuerta, es posible parar el tapón dentro de pocos piés del punto predeterminado. En lugar de viciar varios centenarse de barriles, semejante operación implica sacar sólo menos de un barril.

CONSERVACION DE LAS LINEAS DE TUBERIA

La conservación de las líneas de tubería es actividad de capital importancia para la industria. Durante los últimos diez años se ha alcanzado notable progreso en la protección de la tubería contra la corrosión. Este año, la atención de la industria ha sido dirigida a dos desarrollos, que proveen medios efectivos, para ubicar las irregularidades. La inspección aérea se está empleando como un medio económico de descubrir escapes en las líneas de tubería. Un método de ensayo de presión hidráulica se ha usado para descubir las fuentes potenciales de irregularidades. Estos dos desarrollos se explican separadamente a continuación.

INSPECCION AEREA

Se ha establecido un servicio de inspección aérea sobre 2500 millas de línea de tubería de petróleo crudo y gasolina en la región central, la cual está dividida en dos rutas, recibiendo cada una inspección semanal. La inspección es hecha por un piloto, que tiene a su disposición dos aviones, con velocidades de crucero de 90 y 100 millas por hora. Se han provisto puntos de aterrizaje a lo largo de las rutas. Por resultado, los aviones rara vez vuelan más de dos horas, cada vez. El itinerario está dispuesto de modo que loas aviones se usan alternadamente. Esto hace posible tener un avión siempre listo en un aeropuerto central, para trabajo de conservación y uso de emergencia.

Se ha visto que los escapen se pueden descubir con facilidad y exactitud desde el aire. La mancha de petróleo crudo sobre el suelo se ve claramente, como un punto negro en el fondo verde o castaño del suelo. Por permiso especial de las Autoridades Aeronáuticas Civiles, los aviones de inspección pueden volar de 300 a 500 piés sobre el suelo. El piloto sigue la práctica de observar el terreno como a 100 piés adelante del avión. La señalización entre el avión y las estaciones de bombas se lleva a cabo por paneles terrestres y señales de caída. El costo de la inspección aérea es como la mitad de lo que cuesta el método terrestre corriente. El avión inspección de 400 a 600 millas de línea de tubería al día. Los camiones consumen gasolina de aviación de número octano 73 y vuelan como 20 millas por galón. La inspección aérea ofrece también la adicional ventaja de que mantiene vigilancia sobre partes de la línea que pueden estar expuestas o sujetas a condiciones extraordinarias.

ENSAYOS POR PRESION DE AGUA

El problema de descubrir las faltas, para rectificarlas o corregirlas oportunamente, antes de que provoquen serios trastornos, ha sido atacado por el superintendente general de un importante sistema de líneas de tubería, mediante el ensayo por presión de agua. Como la experiencia ha demostrado que sólo un pequeño porcentaje de las secciones de todo el sistema, necesita reparación o renovación, se ha llegado al entendimiento de que el costo del trabajo de descubrir las faltas ha sido hasta ahora mucho mayor de lo que debería ser. El método de ensayo por presión hidráulica o de agua ha resultado muy efectivo en descubrir los puntos debiles de las líneas de tubería. Gracias a la oportuna rectificación o reparación antes de que se presente la falta, se ha hecho posible el ahorro de dinero y de grandes pérdidas de petróleo. Mediante este método, la línea de tubería se somete a ensayo, aplicándose éste separadamente a secciones de conveniente longitud.

El equipo usado para el manejo del agua y para los fines de presión ha consistido en bombas de aceite de repuesto en las estaciones, tanques o depósitos de repuesto o de agua almacenaje en las estaciones de bombas, centrífugas portátiles de dos etapas, tanques rectangulares de acero de

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Fire hardened steel projectiles through casing, or casings and cement, in the well. The Gun Perforator is run on an ordinary sand line or drilling line, or on drill pipe or tubing. All shots are discharged simultaneously when the top of the gun is struck by the go-devil traveling on the line. Gun can be fired *only at the desired point in the well.* Safely and easily operated by regular well drilling crews—a fact proved by more than four years of service in fields throughout the world. Guns available in more than 30 sizes to fire one to thirty shots per run; projectiles range from 1/8" to 1-1/4". Light in weight; easily transported anywhere; no electrical equipment required.

Disparan proyectiles de acero endurecido por la tubería o tubería y cemento en el pozo. El perforador de pistola se corre en un cable ordinario de bomba de arena o en un tubo de perforación o tubería. Todos los tiros se descargan simultaneamente cuando el tope de la pistola es golpeado por el go-devil que viaja en el cable. La pistola se dispara sólo en el punto deseado en el pozo. Se maneja con seguridad y facilidad por los operarios—Un hecho comprobado por más de cuatro años de servicio en los campos de todo el mundo. Las pistolas se ofrecen en más de 30 tamaños, para disparar de uno a treita tiros por viaje; los proyectiles son de ⅛" a 1¼", de peso liviano; de fácil transporte en todas partes; no se requiere equipo eléctrico.

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DOUBLE-ACTING
ROTARY JARS

Strike either upward or downward blow without change being made in the tool. Force of blow is regulated from the derrick floor. Tripping action and resetting are entirely automatic, accomplished by alternately raising and lowering the fishing string. Packed off for circulation and tested to 6000 p.s.i. Releasing teeth and striking surfaces easily repaired in field by welding without disassembling the tool.

Dan golpe hacia arriba o hacia abajo, sin hacer cambio alguno en la herramienta. La fuerza del golpe se regula desde la torre. La acción de disparo y la fijación con completamente automáticas, realizándose mediante la subida y la bajada alternada del cable de salvamento o pesca. Con obturación. para la circulación y ensayado a 6000, según normas de la P.S.I. Los dientes de disparo y las superficies de golpe se reparan con facilidad en el mismo trabajo, por soldadura, sin desarmar la herramienta.

McCULLOUGH UNDERCUTTING PIPE PERFORATING MACHINE

Cuts Self-Cleaning, Undercut (Keystone) Slots

Cuts clean, smooth-edge slots in pipe of any weight and grade from 3" to 13⅜" O. D., in any desired pattern of longitudinal rows. Slots can be made 100% wider on interior than on exterior surface for self-cleaning. Machine is portable, electrically driven, and can be operated by unskilled labor. SEE 1940 COMPOSITE CATALOG FOR COMPLETE DATA.

Corta ranuras de borde liso en el tubo de cualquier peso o clase de 3 a 13⅜" de diámetro exterior, en cualquiera forma de hileras longitudinales. Las ranuras pueden hacerse 100% más anchas en el interior que en la parte exterior, para la limpieza automática. La máquina es portátil, accionada eléctricamente y puede ser manejada por operarios corrientes.

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The gates at each section are closed and the recording pressure gage in each section is observed to see whether pipe in that section is tight. After detecting the particular section that is leaking, the pipe line is placed in regular operation and the section is then tested by a leak detector, an instrument that amplifies the sound of gasoline escaping from the pipe; however, this is reliable under a limited set of conditions. Crews working with soil augers pull up samples of soils from depths of 3 to 10 ft. Through natural gasoline odors in the soil numerous leaks have been found. The method described is particularly suitable for mountainous country and dry regions where a supply of water is not available for making hydraulic tests.

Pulling section of pipe through casing at railroad crossing

Pasando una sección de tubería por revestimiento en un cruce de ferrocarril

CORROSION

A study has been made of soil conditions existing along a stretch of 25 miles on the pipe line of a major company. In doing this the deepest three pits on each joint were measured; soils traversed by the line were identified and samples were taken of each type of soil. Eight methods were used for determining soil corrosivity and the results were compared with the pit depths observed on the joints of pipe nearest the points where the samples were taken. Since the dispersion of the pit depths associated with each different estimate of the corrosivity of the soils was found to be large, the conclusion was reached that no test of a single sample will indicate reliably the maximum pit depth which may occur near the point where the soil was sampled. However, if data are obtained from a representative number of samples of each soil series, the average corrosiveness of soil series can be determined with a reasonable degree of accuracy by any one of several tests. As the relative merits of tests differ for different soil series, the same tests would not be equally suited for all areas

The importance of microbiological anaerobic corrosion of steel pipe has been brought to the attention of the pipe-line industry this year. It is asserted by students of the subject that more thought should be given to the destructive action of sulfate-reducing microbes present in wet lands through which pipe lines pass. Compared with other types of corrosion, microbiological corrosion proceeds at an abnormal rate. The true value of cathodic protection in localities subject to bacterial attack, remains to be determined. To be effective in these places, it is necessary that the cathodic current change the pH of the solution around the pipe and in the pits to a value sufficient to inhibit or stop bacterial growth.

Considerable work has been done recently with the object of increasing the accuracy of methods used for making tests in connection with cathodic protection. The distributed anode method has been developed to cut the cost of cathodic protection. This method effects important power savings. It calls for the placing of ground anodes carrying much less current and giving a more uniform distribution of pipe to soil potentials at 37 to 50 ft. intervals located approximately 25 ft. from the pipe line.

Recognition of the importance of cooperative effort on the part of pipe-line systems traversing areas where cathodic protection is applied, has led to the formation of an intercompany association in an important group of producing states which serves as a medium for the exchange of information. This makes it possible for companies to take the precaution of bonding their lines in areas where they are affected by cathodic protection applied to other lines. The association also disseminates information regarding developments which are advancing the technique of cathodic protection.

como 40 barriles de capacidad cada uno; manómetros registradores de presión, raspadores de tubería, raspatubos go-devil y varios tamaños de tapones lubricados. Diferentes presiones se han usado para diferentes clases de tubería y con frecuencia se ha aplicado una de más de 1000 libras.

DESCUBRIMIENTO DE ESCAPES DE GASOLINA

En California se ha desarrollado un método para descubrir los escapes en el transporte de gasolina natural. Consiste en hacer ensayos de presión corrientes en el sistema. Como la válvula ordinaria de compuerta no puede cerrarse positivamente hermética contra la gasolina natural bajo alta presión, se han instalado válvulas de cierre positivo, a intervalos de 2 a 10 millas. En la preparación de un ensayo de presión, se instalan manómetros registradores de presión, en cada sección, entre las válvulas de cierre positivo, a fin de obtener una acusación de la presión exacta que existe en cada sección ensayada. Es importante que no exista ninguna obturación por gas en la tubería, mientras se hace el ensayo. La presión se levanta a 500 libras y se mantiene a este punto cerrando todas las válvulas necesarias. Las válvulas de cada sección se cierran y se observa la presión registrada en el manómetro de cada una, para ver si la tubería correspondiente a la sección está hermética al líquido. Después de descubrir la sección particular que tiene escape, la línea de tubería se pone de nuevo en funcionamiento corriente y la sección afectada es ensayada por un detector de escape, el cual es un instrumento que amplifica el sonido de la gasolina que se escapa de la tubería. Este último ensayo, sin embargo, es seguro sólo bajo cierto limitado número de condiciones. Los trabajadores, usando barrenas de suelo, sacan muestras de profundidas de 3 a 10 piés. Debido a los olores característicos de la gasolina natural, se han descubierto numerosos escapes. El método descrito se adapta particularmente a regiones montañosas o lugares secos, donde no hay abastecimiento de agua disponible para los ensayos hidráulicos.

CORROSION

Se ha hecho un estudio especial de las condiciones del suelo a lo largo de 25 millas de línea de tubería, de una importante compañía. Al hacer esto, se midieron los tres hoyos más profundos de cada tubo, y se tomaron muestras del suelo atravesado por la tubería, marcándose cara una con sumo cuidado. Se emplearon ocho métodos para determinar la corrosibilidad del terreno y los resultados se compararon con las profundidades de los hoyos observadas en los tubos más cercanos a los puntos de donde se tomaron las muestras. Como la dispersión de las profundidades de los hoyos asociada con cada diferente cálculo de la corrosibilidad de los terrenos se vió que era grande, se llegó a la conclusión de que ningún ensayo de una sola muestra podrá indicar con seguridad la profundidad máxima del hoyo que puede ocurrir cerca del punto de donde se toma la muestra del terreno. Sin embargo, si se obtienen datos de un número representativo de muestras de cada terreno consecutivo, se puede entonces determinar, con un racional grado de exactitud, la corrosibilidad promedia de todo el suelo, ateniéndose a cualquiera de los varios ensayos corrientes. Como los méritos relativos de los ensayos varían para las diferentes clases de suelo o terreno, el mismo ensayo no es igualmente aplicable a todas las regiones.

La importancia de la corrosión anaeróbica microbiológica de la tubería de acero ha despertado la atención de los fabricantes de tubos este año. Se dice, por los investigadores de la materia, que más atención debería darse a la acción destructiva de los microbios reductores de sulfato presentes en las tierras húmedas por donde pasan las líneas de tubería. Comparada con otros tipos de corrosión, la microbiológica se desarrolla con una rapidez anormal. El verdadero calor de la protección catódica, en localidades sujetas al ataque de bacterias, no ha sido todavía determinado. Para ser efectivo en estos lugares, es necesario que la corriente catódica cambie el control pH de la solución alrededor del tubo y en los hoyos, a un valor suficiente para inhibir o parar el desarrollo de las bacterias.

Mucho trabajo se ha hecho recientemente con el objeto de aumentar la exactitud de los métodos seguidos para hacer ensayos en conexión con la protección catódica. El método de anodo distribuido ha sido desarrollado para reducir el costo de la protección catódica. Este método introduce importantes ahorros en fuerza. Comprende la colocación en el suelo de anodos que llevan menos corriente y que dan una distribución más uniforme de potenciales de tubo a suelo, quedando a intervalos de 37 a 50 piés y como a 25 piés de la línea de tubería.

La aceptación de la importancia del esfuerzo cooperativo entre los dueños de sistemas de líneas de tubería que pasan por regiones donde se aplica la protección catódica, ha conducido a la formación de una asociación formada por importantes compañías ubicadas en varios estados productores, que sirve de medio de intercambio de información. Esto permite a las compañías tomar las necesarias precauciones para el cuidado de sus líneas de tubería en regiones donde son afectadas por la protección catódica aplicada a otras líneas. La asociación distribuye también información relativa a los desarrollos que se presentan en beneficio del progreso de la técnica en protección catódica.

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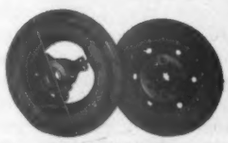

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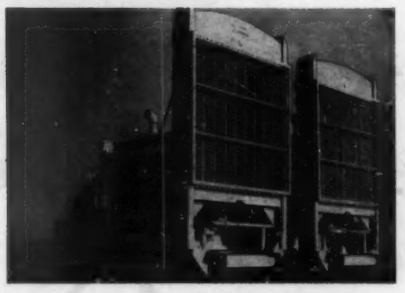

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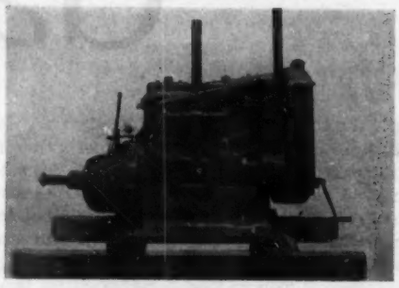

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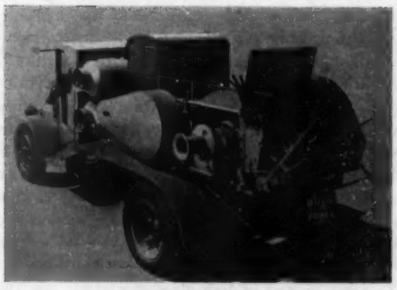

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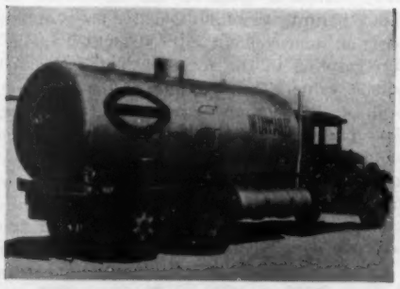

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Magnolia Petroleum Co.'s gasoline plant at St. Louis, Okla., is an example of a plant which has been revamped to enlarge capacity and improve efficiency

La refinería de gasolina de la Magnolia Petroleum Co. en St. Luis, Oklahoma, es un buen ejemplo de establecimiento reformado para aumentar la capacidad y mejorar el rendimiento

Natural Gasoline
Gasolina Natural

IN the United States approximately 8 per cent of the total motor-fuel gallonage originates in the form of natural gasoline. An increasing volume of 12 to 18-lb. vapor-pressure material is being offered, but this still remains substantially below the volume of 26-lb. material manufactured.

This emphasizes the importance of 26-lb. natural as a blending agent for bringing refinery gasolines up to an established standard of volatility. The importance of natural gasoline as a blending agent is further emphasized by the fact that 44 per cent of the gasoline produced in the United States is straightrun. This usually is relatively low in volatility and requires some natural gasoline for blending.

Natural gasoline remains the cheapest means of bringing straightrun gasoline up to the accepted volatility standard, and, at the same time, natural gasoline usually imparts an improvement to the straightrun gasoline in the form of better octane value. The blending of natural, straightrun and cracked gasolines produces the most satisfactory motor fuels for ordinary use, and, so long as straightrun represents such an important part of this blend, natural gasoline will be almost indispensable as a blending agent.

This is mentioned despite the fact that 48 per cent of our gasoline production comes from cracking plants, which gasoline is usually reasonably volatile without the addition of natural.

Running concurrently with this tendency to increase the recovery of butanes and pentanes and the resulting production of more lower vapor-pressure naturals, the industry is witnessing a demand to further increase the volatility of most commercial motor fuels. Obviously, the latter is a desirable development but the industry is not in a position to economically expand its operations.

Instead, much of this added volatility is supplied by refiners and, generally speaking, natural-gasoline-plant operations appear more and more as a branch of crude-oil production. The effect of prorating crude-oil production has been to discourage natural-gasoline-plant installations. Plants cannot be built unless they are relatively large and operate consistently and constantly.

The result has been favorable, however, to the plants which can be justified and are located in new, flush fields, for they are expanded as the field is developed. This is in contrast with the older practice of installing plants in anticipation of the field's early and full development, and after the flush was passed and as the gas volume declined these same plants were forced to operate at only small part of their capacity.

ABSORPTION EQUIPMENT

At no time in the history of the natural-gasoline industry have absorption problems been given more study. At present, the industry is giving special attention to recovering a wider range of hydrocarbons, in contrast with the practice of allowing some of the lightest fractions to pass through the absorbers and be exhausted as residue gas. Now, it is the general practice to absorb all of the propane and bu-

APROXIMADAMENTE el 8 por ciento del total de combustible de motor producido en los Estados Unidos de América, se origina en la forma de gasoline natural. Se está ofreciendo una creciente cantidad de material destilado por presión de vapor de 12 a 18 libras, pero éste todavía continúa siendo menor en cantidad al material de 26 libras producido.

Esto da énfasis a la importancia de la gasolina natural de 26 libras, como agente de mezcla, para impartir a las gasolinas de refinería una norma de volatilidad establecida. La importancia de la gasolina natural, como agente de mezcla, adquiere mayor importancia todavía, cuando se toma en cuenta el hecho de que el 44 por ciento de la gasolina producida en los Estados Unidos de América, se hace por el procedimiento de destilación sin presión. Esta gasolina, por lo general, tiene una volatilidad relativamente baja y requiere, por lo tanto, mezcla con gasolina natural.

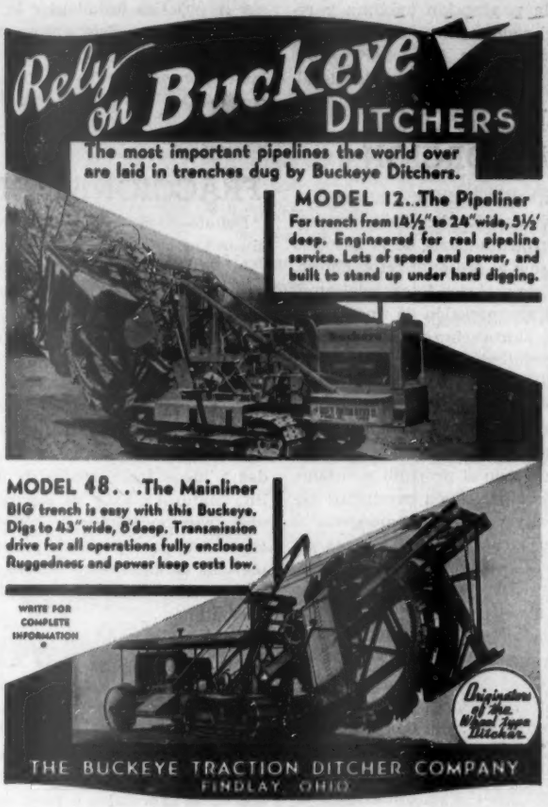
La gasolina natural continuá siendo el medio más económico de elevar la gasolina destilada a presión atmosférica a una norma de volatidad aceptada. Al mismo tiempo, la gasolina natural imparte ordinariamente mejores propiedades a la gasolina destilada a presión atmosférica, en la forma de un mayor número o índice octano. La mezcla de gasolinas naturales, destiladas a presión atmosférica y destiladas bajo presión o desintegración (cracking) produce los combustibles de motor más satisfactorios para los usos corrientes, y mientras la gasolina destilada a presión atmosférica represente tan importante parte de esta mezcla, la gasolina natural será casi indispensable, como agente de mezcla.

Todo esto se menciona no obtante el hecho de que el 48 por ciento de nuestra gasolina se produce en instalaciones de cracking o destilación por desintegración, y que semejante gasolina es generalmente de un grado de volatilidad que no exige la adición de gasolina natural.

Además de la presente tendencia hacia aumentar la recuperación de los butanos y pentanos, a fin de facilitar la producción, en mayor escala, de gasolinas naturales destiladas a menor presión, la industria está presenciando una demanda de mayor grado de volatilidad para la mayor parte de los combustibles comerciales de motor. Por supuesto, esto último es un desarrollo apetecido, pero la industria no está todavía preparada para extender económicamente sus actividades en este sentido.

En lugar de ésto, mucha de la adicional volatilidad es suministrada por las refinerías, y en términos generales, el trabajo de las instalaciones de gasolina natural se presenta, con persistencia continua, como una ramificación de la producción de petróleo crudo. El prorrateo de la producción de petróleo ha tenido el efecto de desalentar a las instalaciones de gasolina natural. Estas no pueden construirse a menos que sean relativamente grandes y funcionen constantemente en grande escala.

El resultado, sin embargo, ha sido favorable para las instalaciones que funcionan actualmente, y muy en particular, para las que están ubicadas en ricos nuevos campos, cuyo progreso ejerce sobre ellas un correspondiente adelanto. Esto contrasta con la antigua práctica de construir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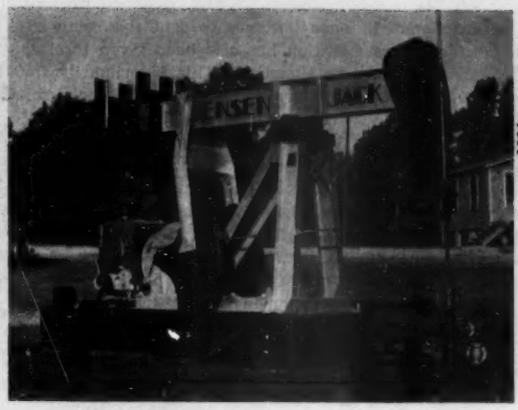

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5th—No es duro o pesado sobre otros equipos de pozo, y por esta razón, todo parece durar más y hacer mejor el trabajo.

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high pressures, and where it is possible to utilize this pressure for the recovery of distillate in the retrograde-condensation range, the problem of prorating the gasoline-plant or distillate-plant operation takes on a much broader aspect. For the purposes of this discussion, however, it may be pointed out that crude-oil production practices play an important part in determining the output of either and directly influence the operations of the ordinary gasoline plants.

Another and an important influence upon natural-gasoline-plant output and production is repressuring. This practice is often correlated with distillate-plant operation but repressuring may be practiced among stripper wells of low output if gas may be had. Obviously, it is not often that large volumes of gas are available for repressuring in those fields where development and production of oil has extended over a long period, but, in a few instances at least, gas is being piped into the old field for repressuring.

The latter practice is of little importance to natural-gasoline-plant operations except to serve as an economic and convenient means for getting rid of large volumes of residue gas from which the natural gasoline has been stripped. The sale or disposition of the residue gas is sometimes difficult and in the face of laws which require utilization of the residue gas as fuel or for pipeline distribution.

ALKYLATION

Within the past year, the practice of combining an unsaturate with an isomer has been developed on a commercial scale and is being practiced in several ways under the general head of "alkylation." This is of greatest importance to refiners who have or can segregate large volumes of each of the two basic charging stocks. However, natural-gasoline manufacturers in several selected areas have both the volume and the quality of materials to interest themselves in alkylation. The problem becomes especially interesting as it becomes apparent that increasing quantities of high-octane aviation gasolines are being sought. The natural-gasoline industry has been quick to recognize this new and growing demand. The demand becomes increasingly strong as aviation-fuel requirements or requests are felt in the United States. Some idea of the nature of the product demanded and the volume needed for such purposes is suggested in the fact that a new model, single-motored, high-speed bomber consumes from 60 to 65 gal. of 100-octane fuel per hour when in full flight.

The place natural-gasoline-plant operations may assume in this broad program is that of supplying large quantities of relatively pure isobutane or isopentane. The former, combined thermally or catalytically with ethylene, for example, produces a fuel of abnormally high-octane value. A plant capable of producing isohexane, in which isobutane and ethylene will be combined thermally to form what is to be known as "neohexane," is being built at Borger, Tex.

TREATING

High octane values and favorable lead susceptibility could not be claimed for natural gasolines if considerable progress had not been shown in treating methods. Recently, it became generally known that sulfur in gasoline tends to depreciate the lead susceptibility of the material as a fuel. Means have been developed to treat the gasoline in such a manner as to retain its octane value as a blending agent and improve its lead susceptibility so that natural may be used as an effective antiknocking agent.

Close-up of residue gas lines from a natural-gasoline plant of Continental Oil Co.

Vista de las líneas de tubería de gas residual de una refinería de gasolina natural de la Continental Oil Co.

cantidad de los productos más volátiles de la instalaciones de gasolina natural, en la forma de propano y butano, mientras que por otra parte están limitando sus compras de las fracciones más densas o pesadas, en la forma de gasolina natural estabilizada.

Al mismo tiempo, como las refinerías están utilizando más y más del butano disponible, en la polimerización, este material debe reemplazarse con gasolina natural. El resultado neto de estos cambios tecnológicos parece que da a entender que más, en lugar de menos gasolina natural y sus derivados, irá a las refinerías, a la vuelta de poco tiempo.

INTERDEPENDENCIA

Esta íntima relación entre los fabricantes de gasolina natural y las refinerías, en lo tocante a la recuperación y utilización de fracciones específicas de petróleo, para su adicional refinamiento o síntesis, nos induce a considerar la interdependencia que existe entre los varios departamentos de la industria del petróleo. Por ejemplo, la producción de petróleo crudo tiene influencia en la producción de gas. En todo lugar donde la producción de petróleo se lleva a cabo sobre la base de prorrateo, hay un consiguiente cambio en la producción de gas. El rendimiento de cada uno no está necesariamente en relación directa, y no se presentan dificultades serias en el funcionamiento o explotación de instalaciones de gasolina en los campos en que la producción de petróleo crudo está prorrateada, salvo cuando se ordenan súbitos cambios en rendimiento; pero, la interdependencia entre una cosa y la otra, es evidente.

En aquellas regiones en que el gas llega bajo presiones anormalmente altas a la cabeza del pozo, o donde es posible utilizar esta presión para la recuperación del destilado en la escala de la condensación retrógrada, el problema de prorratear le producción de la instalación de gasolina o la de destilado, asume un caracter más vasto. Para los fines de este artículo, sin embargo, diremos que los métodos de producción de petróleo crudo desempeñan importante papel en determinar el rendimiento de ambos productos y tienen influencia directa en las actividades de la instalación ordinaria de gasolina.

Otra influencia importante sobre el rendimiento y producción de la instalación de gasolina natural, es la represión. Esta práctica se relaciona, a menudo, con la operación de instalación de destilado, pero la represión puede también practicarse entre pozos de poco rendimiento, en caso de que haya abastecimiento suficiente de gas. Naturalmente, no se presentan, a menudo, grandes cantidades de gas para la represión de estos pozos en aquellos yacimientos en que la extracción y producción se han extendido por un largo período de tiempo; pero, por lo menos, en algunos casos aislados, se envía gas por tubería, al campo de poco rendimiento, para su represión.

Esta última práctica es de poca importancia para las operaciones de la instalación de gasolina natural, salvo como un medio económico y conveniente de desprenderse de grandes cantidades de gas residual, del cual se ha extraído la gasolina natural. La venta o disposición del gas residual es algo difícil, a veces, en vista de los reglamentos que ordenan la utilización del gas residual como combustible o para distribución por línea de tubería.

ALCALIZACION

Durante el año pasado, la práctica de combinar un insaturado con un isomérico, fué desarrollada sobre base comercial, y se está llevando a cabo de varias maneras, todas bajo el encabezamiento general de "alcalización." Esto es de suma importancia para los refinadores, quienes pueden segregar grandes cantidades de cada uno de los dos materiales fundamentales de carga. Los fabricantes de gasolina natural, en ciertas zonas favorecidas, tienen, sin embargo, tanto la cantidad como la calidad de materiales, para interesarse en la alcalización. El problema se presenta especialmente interesante, en vista de la creciente demanda de gasolinas de alto número o índice octano, para motores de aviación. La industria de la gasolina natural ha reconocido, en el acto, esta nueva y creciente demanda. Y esta demanda acrecienta en importancia continuamente en vista de los requisitos y las exigencias que están surgiendo en los Estados Unidos de América. Se tendrá idea del caracter del producto, que se necesita para satisfacer estas nuevas exigencias, teniendo presente que un reciente avión de bombardeo, provisto de un solo motor, de alta velocidad, consume de 60 a 75 galones de combustible de número octano 100, por hora, cuando va en vuelo a toda velocidad.

La función que las instalaciones o destilerías de gasolina natural podrán asumir en este extenso programa será la de suministrar grandes cantidades de isobutano o isopentano relativamente puro. El primero, combinado termal o catalíticamente con etileno, por ejemplo, produce un combustible de un número octano anormalmente subido.

TRATAMIENTO

Se debe principalmente al gran progreso que se ha realizado en los métodos de tratamiento, de las gasolinas naturales, el hecho de que existan actualmente combustibles de motor de elavado grado octano y favorable susceptibilidad al plomo. Recientemente se ha hecho generalmente conocido que el azufre en la gasolina tiende a reducir la susceptibilidad al plomo del material, como combustible. Se han desarrollado procedimientos para tratar la gasolina de modo que ella pueda retener su elevado número octano, como agente de mezcla y mejorar su susceptibilidad al plomo, a fin de que la misma gasolina natural pueda usarse como efectivo agente antidetonante.

U.S.S.R.

(Continued from Page 67)

Siberia as well as construction of a new plant for the manufacturing of welded tubes in Urals, of a new tube-rolling plant in Siberia and for a new tube-casting plant in the central regions of the country. Construction of small steel plants in Central Asia and in Caucasus is to be developed to cover local requirements.

(*h*) "Two plants for the production of artificial fuel oils (synthetic treatment of coal and shale—L. D. W.) are to be constructed. Gasification for domestic needs is to be developed."

A study of the above ambitious program indicates the scope of development contemplated. Undoubtedly, much of the energy that was contemplated for industrial or petroleum developments, in the drawing of the plan, has been diverted to military purposes. This accounts, in a measure, for failure to meet the planned requirements. Generally, it is being carried out, though on a reduced scale. What has been done in 1939?

2. Developments Throughout the Soviet Union in 1939 (Excepting Ural-Volga Area)

(a) Production.

In the Baku area new wells were being drilled and old, idle ones placed in production. By August, 661 idle wells were placed on production, out of a total of 2,230 scheduled for the year; 1,770 new wells were to be drilled. Three new subsea wells, with an initial production of 1,000 tons daily are reported. The June daily averages of production were 10,000 tons more than for January. The plan fulfillments for production were as follows:

	Per cent
First quarter	94.4
April	97.5
May	99.1
June	101.4
July	101.0
August	92.2

In other areas, the August production plan fulfillments were:

	Per cent
Grozneft	99.7
Embaneft	118.4
Bashkirneft	107.2
Mairopneft	133.5

Natural-gas production was 92.1 per cent of plan.

A new, large area, sufficient for 300 locations, was discovered at Malgobek, in the Grozni area. New wells were drilled at Izber-Bash and Achi-Su, in Daghestan, to offset the rapid decline of the old ones.

In the important Romny area in the Ukraine near Kiev, where extensive tests have been made, flowing production was discovered. This is an inland type salt dome and due to its strategic location is considered very important. Six new wells are now being drilled in this and other salt domes nearby.

Extensive testing in the Emba area was completed and several fields, heretofore shut in for lack of outlet, can now be opened due to new pipe-line construction completed in 1939. This is true of the important Karaton and Kulsary fields. Tests to 10,000 ft. have been drilled in this area, setting new records.

New areas were opened in the Maikop district, yielding large flush production. The importance and development of this area can be seen from the following records:

	Tons
1930	505,600
1931	530,600
1932	910,000
1933	?
1934	940,000
1935	1,179,000
1936	1,200,000
1937	1,650,000
1938	2,000,000
1939 (estimated)	2,500,000

The rapid expansion in this area can be accounted for in part by the proximity to the Black Sea and transportation facilities.

In the Kuban-Black Sea area at Ilski, near Kesslerovo, new wells, with initial production up to 160 tons daily, were discovered. This area is becoming increasingly important and can be considered as an extension of the Maikop district.

In Georgia, where high mountains make trans-

REGO LIQUEFIED PETROLEUM GAS EQUIPMENT

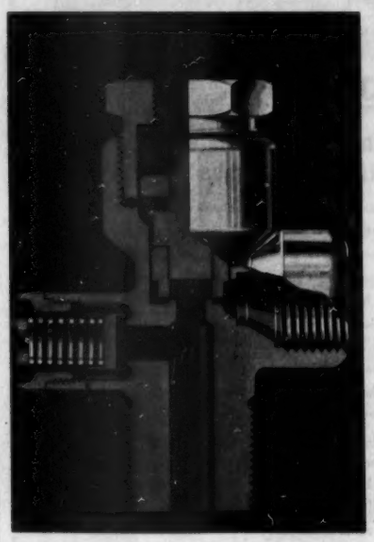

Illustration shows a typical RegO valve, others are available to meet all requirements.

Mostramos aquí una típica válvula RegO. Hay otros modelos para satisfacer cualquier requisitos que se presente.

CYLINDER VALVES

LEAK-PROOF DIAPHRAGMS—Flexible diaphragms allow unrestricted movement of valve seat.

POSITIVE FULL OPENING—Valve seat disc is positioned mechanically. No springs used to effect full opening.

TIGHT CLOSING—Seat Disc of a resilient composition assures positive shut-off.

"POP" ACTION SAFETY VALVE—Assures full relief of excessively high pressures due to overfilling or fire.

EASILY MAINTAINED—All parts subject to wear or fatigue can be easily and inexpensively replaced.

CAREFULLY SELECTED MATERIALS—All materials resist the action of butane and propane in both the liquid and gaseous phases.

VALVULAS DE CILINDRO

DIAFRAGMAS A PRUEBA DE ESCAPES—Los diafragmas flexibles permiten expedito movimiento al asiento de la válvula.

ABERTURA COMPLETA POSITIVA—El disco del asiento de la válvula tiene posición mecánica. Para efectuar la abertura completa, no hay necesidad de resortes.

CIERRE HERMETICO—El disco del asiento es de una composición elástica que asegura un cierre positivo.

VALVULA DE SEGURIDAD DE ACCION RAPIDA—Asegura completo desahogo de las presiones excesivamente altas, debido a sobrelleno o incendio.

FACIL CONSERVACION—Todas las piezas sujetas a desgaste o debilitamiento pueden ser renovadas con facilidad y economía.

MATERIALES CUIDADOSAMENTE ESCOGIDOS—Todos los materiales resisten la acción del butano y del propano, en sus fases líquidas y gaseosas.

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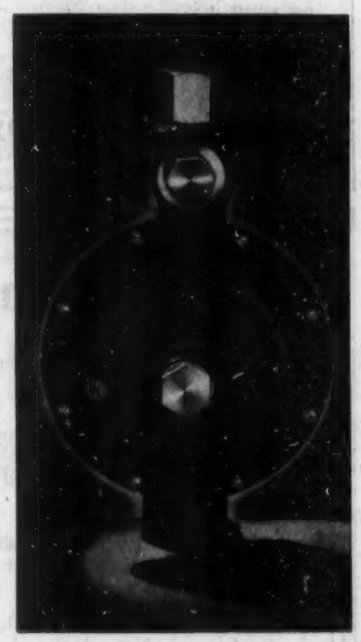
RegO pressure regulators were developed to meet the specific needs of liquefied petroleum gas systems.

FUNCTION: Positive control with regulator installed in any position, covering the full range of tank pressures and delivering accurate and constant outlet pressures, makes RegO regulators the "heart" of any system.

CONSTRUCTION: Simple and rugged construction minimizes wear.

SERVICE: Readily accessible seat and nozzle permits easy replacement of parts subject to wear—no special tools required. Regulator does not have to be taken apart.

SAFETY: A safety relief valve is built into the regulator as an integral part of the body—venting off pressure in excess of 1 lb. per square inch which may develop within the regulator.



REGULADORES REDUCTORES DE PRESION

Los reguladores de presión RegO han sido perfeccionados para responder exactamente a las necesidades específicas de los sistemas de gas de petróleo en forma líquida.

FUNCION: El gobierno positivo, con regulador instalado en cualquiera posición, abarcando la escala completa de presiones de tanque y manteniendo presiones de salida exactas y constantes, hace que los reguladores RegO sean el "corazón" de cualquier sistema.

CONSTRUCCION: Construcción sencilla y firme, para reducir a un mínimo el desgaste.

SERVICIO: El inmediato acceso al asiento y boquilla permite renovar, con facilidad, las piezas expuestas a desgaste, sin necesidad de usar herramientas especiales. No hay que desarmar el regulador.

SEGURIDAD: Una válvula de desahogo de seguridad forma parte integrante del cuerpo del regulador y sirve para dejar salir cualquiera presión en exceso a una libra por pulgada cuadrada, que se desarrolle dentro del regulador.

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- Compact Units for Underground Systems
- Line Valves
- Safety Relief Valves
- Gauging Devices
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- Grupos compactos para sistemas subterráneos.
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Los completos equipos RegO incluyen regulador, múltiples y conexiones, para instalaciones de un cilindro o de varios cilindros.

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The Solution to Your Piston Packing Problems

No more glazed, burned, or dried out cups or packing resulting from dry pump operations due to intermittent service. No more difficulty in maintaining priming and delivery pressures. The solution to pump piston packing problems can be found in LubriKup JerkerKups—a cup made of special plastic compound. Wherever JerkerKups have been used they show a marked superiority over "packed" pumps handling such products as: crude and refined oils (hot or cold); fresh and salt water (hot or cold); kerosene; naphtha; caustic; HCl (15%); basic sediment; etc. They have shown outstanding service in boiler-feed and feed water heater pumps.

Three types of JerkerKups are available: (1) Standard will handle practically all pumping conditions and fluids where delivery pressure does not exceed 750 lbs. per square inch; (2) High Test for excessive temperature and pressure conditions; and (3) Spec. Ang. for certain acids where the temperature is not over 180° F. and delivery pressure not over 750 lbs. per square inch.

» » » »

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La Solucion del Problema de la Empaquetadura de Bomba

No más copas o empaquetadura glaseadas, quemadas o resecadas, a causa del funcionamiento seco debido al trabajo intermitente de la bomba. No más dificultad en mantener la presión de cebadura y descarga. La solución al problema de la empaquetadura de la bomba se halla en LubriKup JerkerKup—una copa hecha de una especial composición plástica. En todo caso, las copas JekerKup han demostrado, en la práctica, una notable ventaja sobre las bombas, provistas de empaquetadura corriente, dedicadas al manejo de productos como petróleos crudos y refinados (calientes o fríos), agua dulce y agua salada (caliente o fría), kerosina, nafta, soda cáustica, HCl (15%), sedimento básico, etc. Han mostrado un servicio sobresaliente en bombas de alimentación de caldera y de alimentación de calentador de agua.

La copa JerkerKup se ofrece en tres tipos: (1) el normal, para casi todas las condiciones de trabajo de bombar y de líquidos, donde la presión de descarga no pasa de 750 libras por pulgada cuadrada; (2) el High Test para condiciones de temperaturas y presiones excesivas; y (3) el Spec. Ang. para ciertos ácidos, donde la temperatura no pasa de 180° F. y la presión de descarga no es más de 750 libras por pulgada cuadrada.

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Envoltura de tubería con máquina portátil

Fast, efficient pipe coating and wrapping in the field by portable machine is the proved modern method for safe protection.

Sizes from 1" to 30" and lengths up to 60 feet are processed at an average rate of two miles per day.

Your specifications are followed by trained crews. Your inspection on the job is final. No risks of damage in storage or transit.

Wrap as you lay—the safest way. Lowest first and last cost. No worries. No delays. Get the records of finished jobs in North and South America.

El método moderno, que asegura la mayor protección posible, está representado por la rápida y eficaz pintura y envoltura de la tubería, en el mismo campo, mediante máquina portátil para este fin.

Tamaños de 1" a 30", con longitudes hasta de 60 pies, se tratan a razón de un promedio de dos millas al día.

Sus instrucciones son fielmente seguidas por cuadrillas muy bien entrenadas en el trabajo. Su inspección del trabajo es final. No hay peligro de daño en almacén o en tránsito.

Envuélvalas mientras las va tendiendo—es la manera segura. El más bajo gasto inicial y final. No hay inquietudes. No hay retardos. Obtenga información sobre los trabajos hechos en la América del Norte y la del Sur.

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portation the chief obstacle, deep horizons at 4,900-4,950 ft. and 8,200-9,900 ft. were being extended in the Mirsaani and Shiraki fields.

The Central Asian district of Turkomania was extensively prospected to meet the growing local needs. At Tcheleken Island, which covers more than 100 square miles and offers tremendous possibilities due to its geological similarity to Baku, deeper drilling during 1939 disclosed important new horizons. The same has been true at Neftdag about 80 miles east from the coast, where wells with initial production of 35,000 bbl. per day have been recorded.

The fertile Ferghana Valley district, 1,000 miles east of the Turkomanian fields, is undergoing extensive development to meet the growing local needs. This area is the center of Soviet cotton growing and silk production. Deep drilling in old fields opened new horizons in the Oligocene as did drilling on new structures in the eastern and northern side of the valley. Many new structures were mapped. The production in the first quarter of 1939 was 20 per cent greater than the same period of 1938. Development is proceeding rapidly as wells are shallow and drilling cheap.

During 1939, the shale industry was expanded. Three new mines were commenced with a designed annual capacity of 1,900,000 tons. The 1938 shale production was 500,000 tons and that of 1939 is estimated at 1,000,000 tons, a 100 per cent increase.

Gasification of underground coal, a unique development known by the author to exist only in the Soviet Union, is proceeding rapidly, after extensive tests. The Soviets claim that gas can be produced by this method at 20 to 30 per cent of the cost of natural gas. Plants are now under construction at Lissichansk, Gorlovka and Kurakhovka in the Donetz basin and also near Moscow, in the Moscow Coal basin. These plants have a designed capacity of 1 billion cubic meters per year.

(b) Pipe-line construction.

In the Maikop area, lines are under construction to connect Kutaiss and Asphalt Mt. with Maikop and from Krasnodar to Maikop, both to tie into the Grozni-Tuapsi trunk line. A pipe line from Malgobek to Grozni (160 km.) was begun in 1939. A new gas line (90 miles) from Malgobek to Grozni was also started in 1939. This is a 10-in. line to operate at 50 atmospheres pressure with a daily capacity of 600,000 cu. m. The present gas production of Malgobek is 200,000 cu. m. A pipe line from Izber-Bash to Makhach-Kala is being completed in 1939. At Emba, the line from Baychinass to Iskini (22 km.) was completed and one from Kaschagyl to Kulsary (20 km.) was started. In the Ferghana Valley area, a line from Changyr Tash field to Tentaik Say (30 km.) was being built in 1939. Three hundred kilometers of gas lines to carry 1,500,000,000 cu. m. of coke gas in the Donetz basin was under construction.

(c) Refinery and machine construction.

In the Maikop district, a natural-gasoline plant and additional carbon-black plants were built. At Moscow, the second cracking unit of the large refinery was put into operation May 30, 1939. At Grozni, the new cracking unit No. 16, capacity 380 tons daily, went into operation in July. New refinery construction and natural-gasoline plant installations are reported in Daghestan and also in the Baku area. At Andizhan and Melnekovo, both in the Ferghana Valley district, refineries are being built with annual capacities of 500,000 tons and 400,000 tons respectively.

The Krasny Molot machine-building plant at Grozni, which started construction of new types of oil-field machinery in 1938, was expanded. In 1939 it began production of hot-oil pumps, propane pumps, high-pressure mud pumps and units for deep-well cementing.

The plants for underground gasification of coal

have been mentioned previously. We now turn to the area under intensive development.

3. The Volga-Ural Region—"the Second Baku"

The area receiving most attention at the present time covers a tremendous territory from the Volga River basin on the west to the Ural Mountains on the east; from the Emba area on the south, northward beyond the Kama district, an area of over 1,000,000 sq. km. Its limits are not definitely set but within this strategic Soviet-Mid-Continent area, production has been found at widely separated points in both the Permian and Carboniferous horizons. Geological research was intensified in the entire area, schools and laboratories established and many field parties sent out.

The 1939 production activities reported consist chiefly in drilling on the huge proved but undeveloped area in the known fields. No new discoveries were reported.

The area has been considered petroliferous from 1768 but the first oil was accidentally discovered in drilling a water well near the Chussovo villages in 1929. Important discoveries followed with Ishimbaevo in 1932, Syzran in 1936, Tuimaza in 1937 and Bugurusian and Yablonovo in 1938. Oil showings in these areas had been known prior to the above dates. Two main producing horizons in the Carboniferous underlie the entire area and many structural features are known. Good shows have been found in a few wells below the Carboniferous. Most of the present production is coming from the Upper Carboniferous zone, although the lower zone is proved at Ishimbaevo and Yablonovo. The oil has a high sulfur content—up to 3 per cent—and a high gasoline content, 25 per cent.

The growth of production (in tons) can be seen as follows:

1929	600
1932	10,600
1934	74,800
1935	413,800
1937	976,000
1938	1,400,000
1939 (estimated)	2,000,000

By the end of the Third Five-Year Plan, 1942, a production of 6 to 7,000,000 tons per year is anticipated. Soviets estimate their proved reserves at 156,000,000 tons and prospective reserves at 1,500,000,000 tons for the area.

The Red Kama field production of 1938 was 30,000 tons and will be doubled for 1939. Ishimbaevo is being rapidly extended also. In September, it was producing approximately 2,600 tons daily and was expected to reach 3,500 tons daily by the end of the year. Tuimaza and Bugurusian received considerable attention in 1939—new areas were proved with outpost wells and the Soviets estimate a minimum of 10,000 proved locations in these fields.

In 1939, the Djessa and Actinbinsk prospects (proved but not developed) near Orenburg and Orsk, were included in the Volga-Ural district to be operated independently from Emba. The discovery of flowing production at Romny has led some Soviet geologists to believe that the area between Romny and the "Second Baku" may connect up. This is an interesting speculation.

New refineries were started at Syzran and Bugurusian and a new refinery is to be built at Tuimaza in 1940, while the Ufa refinery is now being expanded. The second Ufa unit began operations July 1, the third unit being under construction. All refineries in this area are of special Soviet design, being built in units of 500,000 tons. They are high-pressure, complete cracking units. A total refinery capacity of 6,000,000 tons per year is contemplated for this area by 1942.

Pipe lines are now under construction to provide outlets for the Tuimaza and Bugurusian fields, and another 80-km. line is under construction from Stavropol (Yablonovo) to Batraki on the Volga. The Volga River area around Kubishev is receiving intensive attention because the lake

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Para qué tomar el riesgo de retardo usando elementos deformados—o perder tiempo y dinero en hacer reparaciones insatisfactorias, cuando puede Vd. conseguir estos elementos listos para uso en su ensayador—advirtiendo que no son elementos de obturador comunes, sino de primer orden.

Los elementos de obturador Carlyle se hacen de disco de tela y caucho vulcanizado de la más fina calidad. Tienen precisa forma cónica y un acabado prolijo, para asegurar su exacta adaptación y positivo asiento en el agujero de ratón. Su agujero central, del diámetro que se pida, es perfectamente recto de arriba al fondo y el diámetro exterior se precisa a máquina a tamaño exacto, generalmente una pulgada menor que el diámetro interior del agujero principal o revestimiento, para permitir el escurrimiento del líquido de perforación, al bajar el ensayador por el agujero principal.

Podemos suministrar elementos de obturador de repuesto para cualquier ensayador. Los pedidos se despachan el mismo día en que se reciben. Díganos la marca y el estilo, o envíenos sus propios diagramas, para darle cotización.

Carlyle Packer Element on Formation Tester. 2/3 Tapered Style 2

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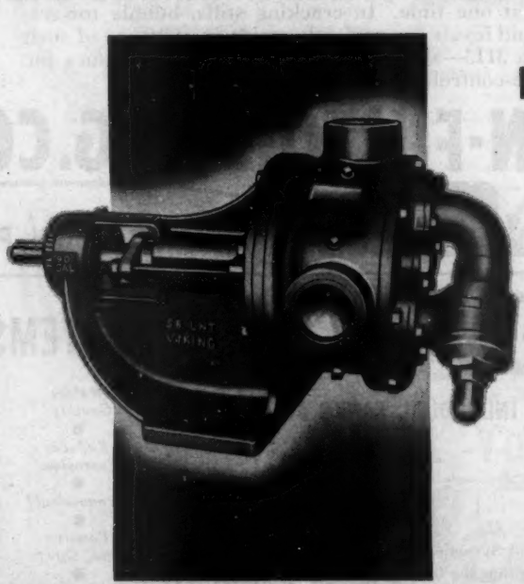
BUTANE and PROPANE PUMP



To meet the growing demand for a new style truck mounting pump for butane and propane service, Viking designed and built this new unit. It's a honey . . . just what you've been looking for. There's a bulletin just completed on this new unit . . . it's stuffed full of complete specifications. Write for a copy today and get the technical story of this new butane and propane truck service pump.

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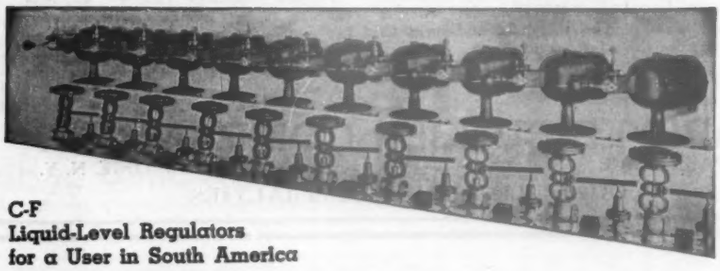

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These Regulators Are Ordered in "Flocks"

The C-F Vigilant Liquid-Level Regulator has so wide a range of usefulness and does what it is designed to do so effectively that customers often find occasion to order a number at one time. In cracking stills, bubble towers, vaporizers, and the like, liquid levels are perfectly maintained by use of such regulators. Ask for Bulletin 3113—also new catalog of C-F Regulators for all requirements of pressure-control.

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Reduces Corrosion!
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Patent Nos. 2,133,381—2,169,411 *Descriptive Literature Sent Upon Request.*

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"Specify Enardo Tank Equipment On Your Next Order".

to be formed by the Kubishev hydro-electric project, now under construction, will inundate a large area. This hydro-electric project, when completed, will be the world's largest.

A machine-building industry to meet the petroleum industry's needs is also being developed in the area. Technical schools for training of local personnel are being established.

It can be seen that a rounded-out program is under way in this Mid-Continent area of strategic military and economic importance to the Soviets. Considerable progress is being made and 1939 was no exception.

4. Acquisition of Polish Fields

Because of the importance of this subject, both the German and Soviet acquisitions will be discussed.

The division of Poland between Germany and the Soviet Union placed the majority of Poland's production in Soviet hands. The Polish oil fields are among the oldest in the world and among the most backward in operations. Modern cable-tool drilling was introduced only in 1922 and rotary drilling is yet unknown. No widescale, secondary recovery methods such as gas or air lift or water drive have been introduced, in spite of their potential application in Poland's fields.

Of the 3,700 producing wells, only 20 are flowing, 2,690 are pumping and 900 bailing and swabbing. In many of the fields, production is less than 1 bbl. per well per day and in some, the daily production is as low as 1 bbl. from 11 wells. In the German-acquired territory, 1,900 wells have a proved area of about 276,000 acres and produce approximately 3,600 bbl. per day. The Soviet Union acquired 1,300 wells with a proved area of 400,000 acres and production of approximately 7,000 bbl. per day.

The fields are located in the southeastern part of Poland on the flanks of the Carpathian Mountains. Production comes from complicated structures in the intensively folded and faited sub-Carpathian zone. The producing horizons are Oligocene, Eocene, Upper and Lower Cretaceous, with as many as seven producing zones in the most important fields of Borysla.. The zones are quite thin and while the fields cover relatively large areas, the total production as well as production per acre is very small.

Production records in Poland date back to 1771, although important development did not start until 1850. Production climbed rapidly from only a few thousand bbl. in 1874 to 6,460,000 bbl. in 1919, since which time it has declined almost without interruption to 3,828,000 bbl. in 1938. This decline has been in the face of an intensive drilling program from 193,000 ft. in 1932 to 496,000 ft. in 1938. Although some fields are known to have undeveloped areas and deeper horizons, no startling developments can be looked for without a complete modernization of drilling and producing technique and equipment. This will be slow in coming. The chief increase will come from secondary recovery methods in the exhausted fields.

Poland's area of 149,500 sq. miles, with a population of 34,000,000, was divided to give Germany 60 per cent of the area with 63 per cent of the population. The Soviet Union took 40 per cent of the area and 37 per cent of the population. The dividing line from north to south follows the Pissa, Bug and San rivers. The German area is the most industrialized, containing 80 per cent of Poland's industries and her best transportation facilities and agricultural lands. The Russian area is largely swamp land and the population is poverty-stricken and backward.

The production from Poland's fields in 1938 was 3,828,000 bbl. All but 400,000 bbl. was consumed internally. The German fields (west of the San River) in 1938 produced 1,340,000 bbl.—about 35 per cent of the total, whereas the newly acquired Soviet fields east of the San River produced 2,488,000 bbl.—about 65 per cent of the total.

The consumption of oil in the German section in 1938 was approximately 2,757,000 bbl.—that in the Soviet section 671,000 bbl. Thus, Germany acquired a deficit of 1,417,000 bbl. and the Soviet Union a balance of 1,817,000 bbl. in the excess of consumption.

In the refining situation, Germany acquired 14 plants with a capacity of 2,500,000 bbl. annually, including two cracking units, whereas the Soviet acquired 23 refineries with a capacity of 6,200,000 bbl. including one cracking unit.

The transportation problem in the German area is relatively simple due to a close pattern of railroads. This does not apply to the Soviet section where transportation is complicated and costly.

A close examination of each individual field of Poland indicates that the majority of the important fields, including the gas field Daszawa, the Borysław area which has produced over 70 per cent of Poland's total oil production (5,100 bbl. per day 1938 production), and the Rypne-Duba fields are in the Soviet territory, whereas the new (1931) and important Gorlice oil fields are in the German region. Both sections have some additional prospects.

Although the condition of the fields at the time of acquisition is unknown to the author (some reports indicate that they were destroyed), he is of the opinion that until the European scene is more settled, the Soviet Union will do little to improve them. They may be used for local supply but little else, and will not materially affect the development program or economy of the balance of the Soviet Union.

Conclusions

Despite the silence and censorship resulting from the present European political scene, and despite the dislocation of funds, equipment and personnel from that planned for the petroleum industry to direct war industry in the Soviet Union, there is sufficient factual evidence to indicate for 1939 substantial progress on all fronts of the petroleum industry, especially in the Volga-Ural region.

The acquisition of the Polish fields by the Soviet Union in 1939, aside from keeping them from Germany, will have no material, direct benefit to the Soviet Union at present. The reserves and sizeable production will be an important asset if they remain in Soviet possession after the settlement of the present European crisis.

Goes to Caracas for International

International Harvester Export Co., Chicago, has appointed Walter Bitterling representative for the British West Indies, Curacao, French and Dutch Guianas, and Venezuela, with headquarters in Caracas, Venezuela.

Mr. Bitterling, a resident of Tulsa since 1916, spent more than 3 years with Standard Oil Co., of Venezuela, in South America, where he was engaged in industrial-relations work at Caripito. Recently he spent considerable time in Venezuela for Williams Brothers Corp. in the construction of the Mene Grande Oil Corp.'s 100-mile 16-in. oil line. International trucks were used exclusively. Mr. Bitterling is studying oilfield operating and transportation problems in the Mid-Continent area, and will sail for South America shortly after the first of the year.

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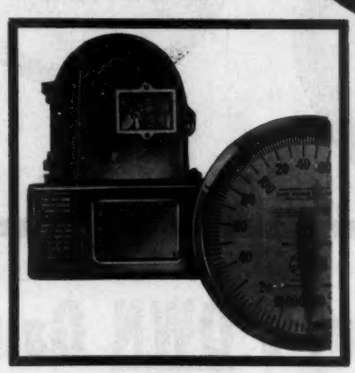

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Socony-Vacuum Oil Co., C. A., Increases Venezuela Drilling

THE Socony-Vacuum Oil Co., C.A., plans to continue its operations in eastern Venezuela on the same scale as those of this year, with the exception of increasing its drilling operations as soon as any one of the several wildcats drilling indicates the possibility of proving a commercial oil field.

In addition to the operations in the northern part of the State of Anzoategui in the San Joaquin-Roble area, it is expected that tests will be put down in the southwestern area of the State of Monagas and likewise in the south central area of the State of Guarico.

The Socony-Vacuum Oil Co., C.A., was formed early in 1935 to endeavor to develop production of crude oil in the area of eastern Venezuela comprised of the states of Monagas, Anzoategui, and Guarico. During 1935 the company was able to purchase only a few concessions and these were obtained from third parties who had secured them from the government.

In 1936 the company negotiated with the Venezuelan Government a transaction that amounted to about 900,000 acres, and in 1937 made an additional deal that secured about 870,000 acres more.

Altogether the company obtained a total of 2,050,000 acres in eastern Venezuela divided over the three states in approximately the following figures: Anzoategui, 930,000 acres; Monagas, 332,000 acres; Guarico, 788,000 acres.

At that time the company had only a very small staff in Caracas and in the field. Field headquarters consisted of a small adobe house outside the town of Pariaguan, and the personnel was composed of two field geologists and one magnetometer party.

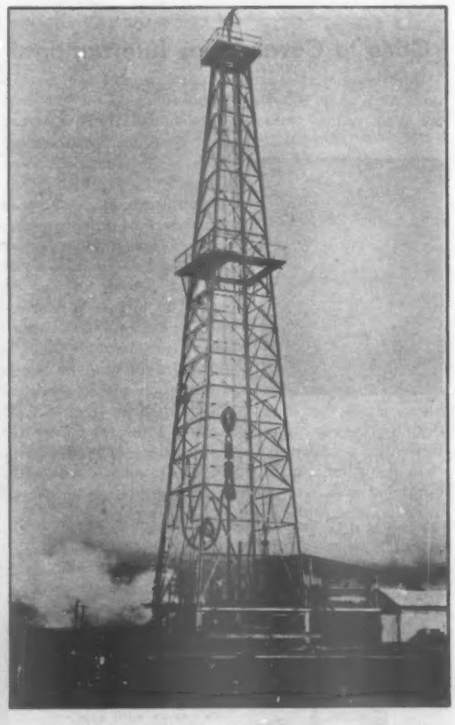
In the following year, 1938, a permanent camp and field headquarters was established a short distance outside Pariaguan, and the organization was added to steadily during the year. In August a slim-hole drilling outfit powered by diesel engines started exploration work. A seismograph crew was contracted, and field geological parties, torsion-balance and magnetometer parties were operated.

The company intensified its exploration program during 1939 and likewise increased its drilling operations by the purchase of a second diesel rig for wildcatting to 8,000 ft. and steam equipment in the 10,000-ft. drilling range. A second steam outfit will be introduced early in 1940.

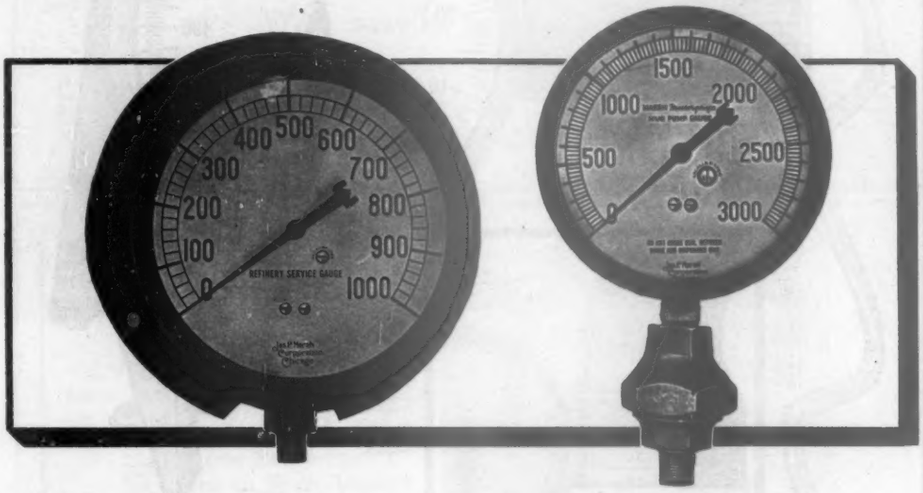
During the present year, to date, two gravity-meter parties have covered some 5,000,000 acres, while magnetometer and torsion balance have accounted for a much larger acreage. Two structure-testing drills have been kept busy and have drilled approximately 100,000 ft. of core hole. The small diesel outfit has completed eight slim-hole tests, which have resulted in some production of very heavy asphaltic oil which is not considered at this time to be commercially exploitable.

The heavier rigs will be kept busy during the coming year on drilling locations in the San Joaquin and Roble areas in northern Anzoategui. It is hoped that concessions held by the company in this area will be productive of a good gravity oil. Both Standard Oil Co. of Venezuela and the Mene Grande Oil Co. (Gulf) are drilling in this area.

The company secured from the State of Anzoategui a lease for a period of 40 years on three pieces of land which may some day be suitable for a sea loading terminal and refinery site. These blocks are located between the city of Barcelona and the town of Puerto la Cruz, the port site facing on Pozuelos Bay, which will allow the largest ocean-going tankers to load oil. The complete area of these tracts amounts to some 1,500 acres.



Wildcat rig drilling at Carrizal No. 1



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C. E. WHITNEY — Baker Oil Tools, Inc., Houston

NOMADS: Here are a septet of Nomads whose pictures reached the editorial offices too late to be included with the general layout on Pages 148-149 and 153

War Gives Impetus to Refinery Expansion

(Continued from Page 80)

capable of handling 2,500 bbl. per day. This work was completed in 1939, although it was started in 1938.

The political position of Rumania has been particularly discouraging to new refinery expenditures in recent months, but this condition is accumulating an impressive potential volume of construction work for peacetime execution.

South America is receiving a large portion of refinery construction work.

The Brazilian Petroleum Council, a government agency, is negotiating with American engineering firms for construction of one and possibly two refineries. Indications are contracts will be executed in 1940.

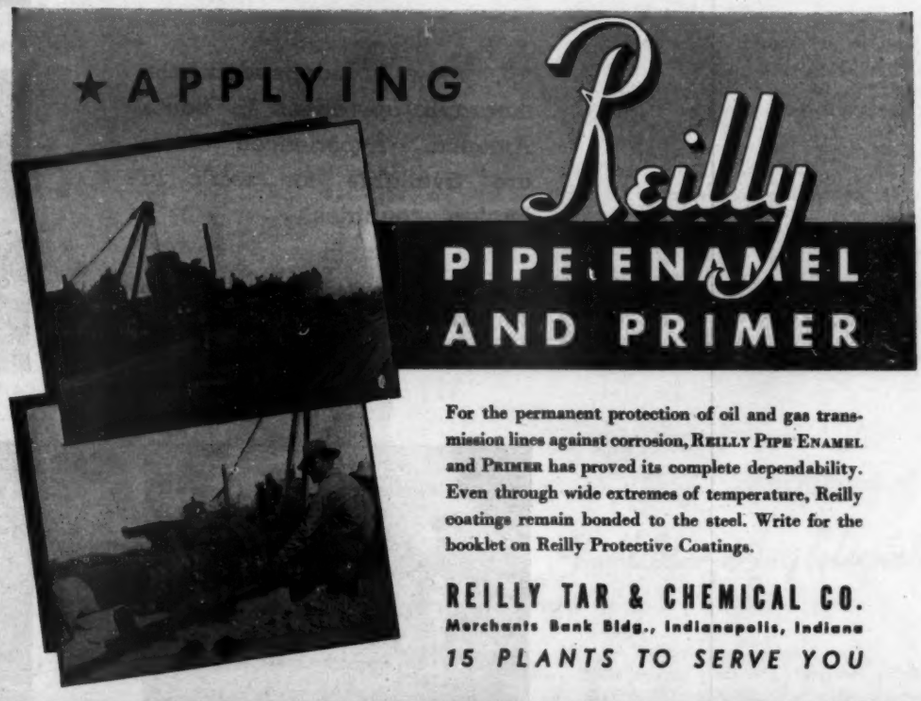
Building New Units

Two complete combination skimming and cracking units are under construction in Argentina, at Salta and at Lujan de Cuyo which is in the Province of Mendoza. The Salta plant will have capacity of approximately 1,900 bbl. per day and that at Lujan de Cuyo will handle 3,150 bbl. per day of Tupungato crude. Both refineries are being constructed by Yacimientos Fiscales Petroliferos, the government agency. Within the past few weeks, Y.P.F. entered into contract for construction of a viscosity-breaker unit of 6,000 bbl. per day at the La Plata refinery. Capacity of the La Plata refinery has been under frequent expansion during recent years. A new combination unit at La Plata was commissioned in September and is in service, topping, cracking reduced crude, cracking heavy gas oil, light gas oil, and in treating gasoline in the vapor phase. The unit also includes a thermal polymerization plant with a daily charging capacity of 1,500 cu. m. in addition to 10,000 cu. m. of propane and butane obtained at various sections of the refinery.

One of the major construction jobs in South America this year was the topping plant and viscosity breaker built by Standard Oil Co. of Venezuela at Carapito. The Carapito refinery now has a crude-oil capacity of 26,800 bbl. per day, and the viscosity breaker will handle 22,800 bbl. per day, making it the largest plant in Venezuela.

Expansion of refining capacity on the Netherland West Indies islands of Aruba and Curacao has been practically uninterrupted since the plants were first established for refining Venezuelan crude oil.

Contract has been let by Cia. Petrolio Ganso Azul (Blue Goose Oil Co.) for construction of a 1,000-bbl. per day skimming plant at the site of its discovery at Aguas Callentes on the Pachieta River in the interior of Peru.



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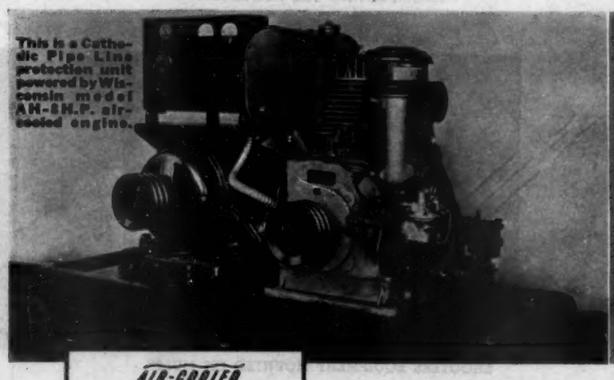

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FIELD OPERATIONS

Summarizing the Week's Developments

KANSAS—A gas well in the Cairo sector of the Cunningham field, Pratt County, began producing oil after acidizing, making a potential of 374 bbl. Nearest oil production is in the Kingman-Pratt County sector of the Cunningham field, 5 miles northeastward. Extension producers were near completion in the Hoisington pool, Barton County, and Snider area, Stafford County. Wildcats were started in Gove and Rawlins counties, northwestern Kansas.

OKLAHOMA—Wilcox sand is the goal of a wildcat started the day after Christmas on a trend north from the Ramsey pool, Payne County. The 14,582-ft. wildcat in Washita County was abandoned after efforts to develop production in upper zones failed.

ILLINOIS—A 3,889-bbl. well, producing from the Devonian lime in the Salem pool in Marion County, was the best of the week. Thirty-five wells are drilling to the Devonian in Salem field. City council of Centralia will permit the drilling of two Devonian wells to the city block, but requires $10,000 bond posted for each well drilled, and other exactions. Production of Illinois fell off 9,141 bbl. a day.

TEXAS: Gulf Coast—A 1-mile extension was given the Anchor pool in Brazoria County. The 5,700-ft. sand recently opened in the West Ranch field in Jackson County may extend at least 2½ miles eastward.

Southwest Texas—Two outposts in the Victoria area, Victoria County, are in the spotlight as production tests are being made with encouraging showings.

North and East Texas—A third pay has been opened in the Rogers & Rogers pool in Montague County. A 2,500-ft. pool was uncovered in Cook County, 5 miles southeast of Gainesville. The Hunt interests have laid a pipe line to the new Glen Rose distillate pool in Limestone County and started drilling the second well in the pool. Gas from the discovery well is being piped to the East Texas field for repressuring purposes.

West and Central Texas—Continental Oil Co. will drill another Ordovician wildcat in Crockett County. The Tubb pool in western Crane County was extended ¾ mile southeastward. Sloan & Zook's wildcat in northeastern Yoakum County uncovered sulfur water at 5,124 ft. and is shut down for orders. The Ivy pool in Shackelford County has a third pay and may have a fourth, the latter below the Palo Pinto-lime pay.

CALIFORNIA—The Dominguez field was twice extended westward by better than 1,000-bbl. wells. The Wilmington field has resumed activity with 10 new derricks up and six additional locations staked.

MISSISSIPPI—In the Tinsley field, Yazoo County, Union Producing Co. expected to complete another oil well this week, the eighth in the field.

COLORADO—A 300-bbl. well in the Dakota sand in the Fort Collins field is said to be the first to produce from that formation east of the Rocky Mountains.

Completions in All Fields

(Week Ended December 23, 1939)

	Oil	Gas	Dry	Total	1939 total comp. to date	1938 total comp. to date
N. Y., Pa., and W. Va.	51	14	3	68	3,243	3,458
Ohio	12	10	4	26	1,039	967
Indiana	4	3	6	13	345	133
Kentucky	6	1	6	13	703	890
Illinois	59	2	5	66	3,609	2,218
Michigan	23	2	12	37	1,434	928
Kansas	20	1	7	28	1,346	1,554
Oklahoma	12	2	9	23	1,702	1,666
Texas:						
North Central Texas	47	1	24	72	2,432	3,002
West Texas	41	0	4	45	1,867	1,933
Texas Panhandle	11	0	1	12	442	549
East Texas	5	0	0	5	380	1,703
East Central Texas	0	1	1	2	83	338
East Texas Border	0	0	0	0	252	128
Gulf Coast Texas	23	1	3	27	1,330	1,290
Southwest Texas	42	1	12	55	2,206	2,150
Total Texas	169	4	45	218	8,992	11,093
North Louisiana	10	3	2	15	517	616
Gulf Coast Louisiana	16	0	7	23	707	482
Total Louisiana	26	3	9	38	1,224	1,098
Arkansas	0	0	1	0	242	247
Montana	0	1	1	2	164	108
Wyoming	4	0	1	5	138	158
Colorado	0	0	0	0	13	13
New Mexico	5	0	1	6	585	569
Utah	0	0	0	0	0	3
California	23	1	3	27	929	1,251
Total United States	414	44	113	570	25,708	26,354
Total previous week	419	45	133	597		
Week ended Dec. 24, 1938	362	56	122	540		

Outstanding Fields—Highlights

(Week Ended December 23, 1939)

FIELD—	Rigs up	Wells drlg.	Weekly oil completions	Initial prod.	Total No. oil wells	Daily av. prod.
TEXAS						
K.M.A.	24	50	3	2,608	1,213	31,687
Wasson-Bennett	22	77	16	14,673	574	26,330
Ector County	10	79	7	5,721	1,972	61,100
Pecos County	7	24	3	572	1,221	38,798
Jones County	3	20	4	506	598	8,470
East Texas	4	15	5	750	26,147	492,850
OKLAHOMA						
St. Louis	7	34	3	1,095	914	33,500
Cement	6	19	0	0	278	5,400
KANSAS						
Barton County	5	22	3	615	511	18,205
Ellis County	4	17	5	1,540	466	12,285
Rice County	6	25	2	354	1,410	32,035
Russell County	5	29	3	1,631	1,383	28,055
NEW MEXICO						
Lea County	11	54	4	1,335	2,330	96,110
Eddy County	9	58	1	600	480	13,490
LA-ARK-TEX						
Cotton Valley, La. (deep)	1	6	1	600	148	13,765
Magnolia, Ark.	0	7	0	0	81	20,355
MICHIGAN						
Freeman-Redding	1	11	1	200	130	15,174
Kent County	6	45	9	1,799	240	15,784
CALIFORNIA						
Montebello	2	26	5	2,351	334	27,750
ILLINOIS						
Salem	6	81	23	18,495	1,522	183,550
Louden	5	38	4	935	1,267	73,306
Other basin fields	49	229	32	6,566	1,989	68,830
Old fields	....	.....	....	.....	.....	8,998

Illinois, Indiana and Kentucky

By STAFF CORRESPONDENT

Production Off 9,141 bbl.; Close Spacing in Centralia

MATTOON, Ill., Dec. 26.—Production in Illinois last week fell off 9,141 bbl. per day to a total of 334,684 bbl. per day. Salem produced an average of 183,550 bbl.; Louden, 73,306 bbl. and other basin fields 68,830 bbl. The old fields of the state produced 8,998 bbl. per day.

Fifty-nine oil wells were added in last week's roundup of field work. Five wells were dry holes and two were gas wells, making a total of 66 completions reported. Fayette County had a dull week with 6 oil wells and 935 bbl. initial production, 1 dry hole and 1 gas well. Marion County, 24 oil wells, 18,495 bbl. new production; Clark, one 35-bbl. well; Clay, 2 oil wells, 943 bbl., and 1 dry hole; Clinton, one 135-bbl. well; Richland, 3 wells, 1,725 bbl.; Edwards, 2 wells, 250 bbl.; Gallatin, one 40-bbl. well; White, 8 wells, 1,746 bbl.; Washington, one 49-bbl. well; Wayne, 4 wells, 1,215 bbl.; Wabash, 6 oil wells, 428 bbl., and 1 dry hole. Coles and Peoria counties each had a dry hole and Lawrence County a gas well.

Thirty-five wells are drilling to the Devonian lime in the Salem pool, and several of these were near completion at the close of the report. The largest well of the week was completed by Magnolia Petroleum Co.'s No. 28 W. B. Young, which flowed 3,889 bbl. after an acid treatment in Devonian lime at 3,365-85 ft. Previously it had flowed 1,516 bbl. a day naturally.

A new townsite drilling campaign is on in Centralia, where the city council decided to permit two Devonian-lime wells to be drilled on a city block. It will be necessary for each operator to post a $10,000 bond before drilling operations start and that a fire extinguisher be installed at each well. Under the conditions named, it is a question whether or not many deep wells will be drilled within the city.

Following is the completion list, the initial production representing 24 hours unless otherwise stated:

Fayette County

In the St. James pool in Fayette County Ohio Oil Co.'s No. 5 Sworm, SE NE NE Section 36-6n-2e, shot with 7 qt. at 1,595-1,609 ft., pumped 182 bbl. Texas Co.'s No. 5 Griffith, SE NW SE Section 25-6n-2e, pay at 1,605-11 ft., pumped 147 bbl.

In Township 8n-3e, Louden pool, Carter Oil Co.'s No. 9 Wright, SE NW NE Section 21, shot with 50 qt. between 1,570 and 1,596 ft., swabbed 60 bbl. Robert E. Markham and Wilson and others' No. 2 Emmerson, NE SE SW Section 31, shot with 40 qt. in Cypress sand at 1,501-24 ft., pumped 90 bbl. Carter Oil Co.'s No. 3 Smith, SW SW SE Section 31, shot with 30 qt. at 1,501-11 ft., swabbed 216 bbl. Carter's No. 1 Kimbrell C. C. N½ S½ N½ Section 29, shot with 70 qt. at 1,372-1,416 ft., swabbed 240 bbl. Carter's No. 27-1 Hogan, NW cor. Section 27, completed as a gas well, production not learned, total depth 1,506 ft. Stewart's No. 1 Rhodes, SW SW SW Section 26, dry and abandoned at 1,616 ft.

In Clark County Joe Hassett's No. 1 Ingersoll, 600 ft. from west and 990 ft. from south lines of NW SE Section 29-11n-14w, pumped 35 bbl. of oil and 2 bbl. of water, total depth 1,058 ft. (Carpenter sand).

In Coles County LeRoy Trulock and Mumford's No. 1 Trulock, SE SE NE Section 18-12n-14w, dry and abandoned at 603 ft. Ste. Genevieve lime topped at 490 ft (depth estimated).

In Peoria County Algonia Oil Co.'s No. 1 Cramer, SE SE SW Section 27-8n-5e of fourth principal meridian, dry and abandoned at 1,560 ft. Devonian lime topped at 784 ft., Silurian at 857 ft., Plattin at 1,186 ft., Glenwood at 1,480 ft.

Marion County

In the southern end of the Salem field, Township 1n-2e, in Marion County, Texas Co.'s No. 8 Farthing C, SW NE NE Section 4, previously reported with an initial of 1,162 bbl. per day, actually produced 154 bbl. Texas' No. 13 Fyke, Section 17, McClosky lime at 2,056-65 ft. and 2,072-74 ft., acidized with 2,000 gal., pumped 196 bbl. Texas' No. 14 Bryant, NW SW NW Section 9, 15-bbl. well from Benoist sand topped at 1,839 ft. Texas' No. 23 Hawkins, SE cor. SW NE NW Section 8, shot with 30 qt. at 1,837-67 ft., Aux Vases sand, flowed 735 bbl. Texas' No. 14 W. Friederich, NW SE NE Section 8, 200-bbl. well from Benoist sand at 1,831-64 ft. Texas' No. 5 Carr C, SW NE NW Section 8, Aux Vases sand at 1,808-78 ft., shot with 70 qt., flowed 2,240 bbl. Texas' No. 4 Carr A, NE SW NW Section 8, shot with 90 ft. in Benoist and Aux Vases sands, 1,780-1,870 ft., flowed 1,966 bbl. Gibson & Jennings' No. 1 Phillips, SW cor. NE SW NW Section 7, shot with 120 qt. at 1,855-78 ft., flowed 250 bbl. of oil and 5 bbl. of water. Texas' No. 23 Johnson, NW SE SE Section 6, shot with 90 qt. at 1,731-1,821 ft., Benoist and Aux Vases sands, flowed 1,715 bbl. Texas' No. 11 Johnson, SE NW SE Section 6-1n-2e, shot with 65 qt. at 1,751-1,816 ft., Benoist and Aux Vases sands, flowed 2,072 bbl. Texas' No. 8 C. E. Richardson B, SW cor. SE SE SE Section 5, acidized with 2,000 gal. in McClosky lime at 2,011-45 ft., pumped 182 bbl. Texas' No. 5 C. Reed A, SW NE NW Section 5, shot with 90 qt. in Aux Vases at 1,725-1,815 ft., flowed 2,058 bbl. Texas' No. 18 City of Centralia, SE cor. NE NE NE Section 5, Benoist at 1,780-1,818 ft., pumped 455 bbl. Texas' No. 43 City land, SE cor. NE NW NE Section 4, Benoist at 1,843-67 ft., pumped 126 bbl. Texas' No. 42 City land, SW cor. NE NW NE Section 4, Benoist at 1,551-81 ft., flowed 266 bbl.

In the north end of the Salem pool, Township 2n-2e, Shell Oil Co., Inc.'s No. 4-A Farthing, NE SW NE Section 32, shot with 25 qt. at 1,844-62 ft., flowed 271 bbl. Shell's No. 3-A Farthing, SE SW NE Section 32, shot with 25 qt. at 1,849-66 ft., flowed 300 bbl. Texas Co.'s No. 8 Stroup, SW cor. NW NW NW Section 31, McClosky lime at 2,048-58 ft., pumped 126 bbl. Texas' No. 12 Friederich, SW NW NW Section 29, Benoist at 1,862-85 ft., pumped 84 bbl. Magnolia Petroleum Co.'s No. 27 W. B. Young, C S½ NE SW Section 21, McClosky at 2,027-66 ft., acidized with 4,000 gal., pumped 160 bbl. Texas' No. 5 Sweney, SE NW NW Section 20, pays at intervals from 2,046 to 2,095 ft., pumped 196 bbl. Ohio Oil Co.'s No. 30 M. Young heirs, acidized through perforations at intervals from 2,090 to 2,306 ft., flowed 90 bbl. in 3 hours. Magnolia Petroleum Co.'s No. 28 W. B. Young, NE SW NE Section 20, Devonian lime top at 3,315 ft., pays at 3,365-85 ft. and 3,390-3,400 ft., flowed 1,516 bbl. naturally; acidized with 1,000 gal., it flowed 3,889 bbl. per day. Texas' No. 24 Jett, SE SW SW Section 16, McClosky pays at 1,992-2,057 ft., pumped 112 bbl.

In the Fairman pool Shell Oil Co., Inc.'s No. 1 Ahlf, NW cor. SW¼ Section 18-3n-1e, Marion County, Benoist at 1,431-40 ft., pumped 67 bbl. in 23½ hours. Shell's No. 1 Kreitler, NE cor. SE¼ Section 13-3n-1w (Clinton County), 135-bbl. well from Benoist at 1,440-49 ft.

In Clay County Pure Oil Co.'s No. 4 Hubble, C W½ SE SW Section 4-1n-8e, pay at 3,023-78 ft., at intervals, flowed 525 bbl. Pure Oil Co.'s No. 1 Coulter, C E½ SE SE Section 33-2n-8e, pay at 3,045-55 ft., acidized with

(Continued on Page 358)

INDIANA

EVANSVILLE, Ind., Dec. 26.—A 300-bbl. well in the New Harmony pool was the best of the completions in the Evansville district reported last week.

In Gibson County Continental Oil Co.'s No. 1 Thrash, NW NE SW Section 18-3s-13w, sand at 2,521-27 ft., flowed 45 bbl. in 10 hours.

Harry Fotiades' No. 1 Fleener, SE NW SE Section 21-3s-12w, is a rig up. Hawk, Damron and others' No. 1 Dotterweich, SE NE NW Section 8-4s-3w, moving in tools for a test to the Devonian, expected to be topped around 1,400 ft. Lewis Production Co.'s No. 1 Dunn, 330 ft. from north and 50 ft. from west lines of SE SW Section 18-3s-13w, location.

In Pike County A. J. Walker and others' No. 1 Johnson, NW SE SE Section 19-1n-6w, was dry and abandoned at 748 ft. A. J. Walker's No. 1 Garrison, NW NE NE Section 30-1n-6w, dry and abandoned at 898 ft. It had 50,000 cu. ft. of gas at 708 ft. Walker and others' No. 1 Hancock, SE NE NW Section 30-1n-6w, dry and abandoned at 1,174 ft. It had 40,000 cu. ft. of gas at 748 ft. Walker and others' No. 1 Denam, C S½ NW NE Section 30-1n-6w, dry and abandoned at 748 ft.

In Warrick County S. R. Travis and others' No. 1 Moyer, NW SW NW Section 13-5s-9w, spudded.

In Spencer County Kentucky Natural Gas Co.'s No. 1 Hall, C SW SW Section 29-7s-6w, sand at 957-64 ft., 3,287,000 cu. ft. of gas. Kelley and others' No. 1 Hayden, C SW SW Section NE SE Section 30-7s-6w, sand at 892-902 ft., 12,118,000 cu. ft. of gas.

New operations started included Kelley and others' No. 1 Axton-Cope, NE NW SE Section 30-7s-6w, spudded. S. R. Travis and others' No. 1 Mayer, NW SW NW Section 13-5s-9w, spudded. Harry Fotiades' No. 1 Flee-

(Continued on Page 340)

WESTERN KENTUCKY

OWENSBORO, Ky., Dec. 26.—Five oil wells, one gas well, and six dry holes were completed in the past week in review in the western Kentucky fields, and 10 new operations started. Following is the record:

Breckinridge County, McQuady district: Charles Stewart's No. 2 Annie Howard, abandoned at 275 ft.

Butler County, Silver City district: Cumberland Petroleum Co.'s No. 4 Lee Hawkins, rigging up. Mount Zion School district: South Penn Oil Co.'s No. 1 A. Jenkins, drilling at 450 ft.

Daviess County, Utica district: H. C. Farmer and others' No. 2 J. E. Brown, shot in Jones sand with 100 qt. at 1,238-60 ft., drilling deeper to the Barlow sand. H. C. Farmer and others' No. 1 Vernor Fitts, location. Stewart, Snyder and Major Oil Co.'s No. 4 Roy Hansford, east tract, location. C. E. Daugherty's No. 6 C. W. Howard, estimated 175-bbl. well in Jett and Jones

(Continued on Page 351)

OHIO FIELDS

FINDLAY, Ohio, Dec. 26. — Attention in the Ohio fields is focused on three widely separated deep tests. In Medina County, Brunswick Township, McCrea and others are drilling at 5,013 ft. with a hole full of salt water. The water was first encountered at 4,930 ft. and has gradually increased, with the depth. In Knox County H. E. Perkins, in Lot 8, Howard Township, is drilling in Trenton lime at 4,250 ft. In southwestern Ohio Sun Oil Co. is drilling at 1,683 ft., in Caesar Creek Township, Greene County.

In Athens County, Ames Township, Carpenter & Glazier's No. 23 John Smith, Section 13, is a 5-bbl. pumper in first Cow Run sand at 359 ft. Canaan Township, A. J. Tolley's No. 2 B. K. Morris, Section 8, gaged 400,000 cu. ft. of gas, open flow, from the Stray sand at 520 ft. In Rome Township McBill Oil Co.'s No. 6 H. M. Antle, Section 30, has a settled production of 2 bbl. of oil from first Cow Run sand at 407 ft.

In Ashland County, Lake Township, Faulkner & Phelps' No. 3 H. W. Mosher, Section 22, is a small gas well in Berea sand at 600 ft.

Fairfield County, Walnut Township, Gas Producing Co.'s No. 3 Plum, Section 23, had an oil showing in the Newburg at 1,979-85 ft., was acidized, but made only 6 bbl. of oil in the first 24 hours after acidization.

Guernsey County, Wills Township, John Bindas and

(Continued on Page 348)

Rocky Mountain Area

By T. R. INGRAM

300 bbl. Well, Dakota Sand, in the Old Fort Collins Field

DENVER, Colo., Dec. 26.—Staking of a wildcat test each in Eddy and Chaves counties, New Mexico, together with completion of Eddy County's new pool opener or east extension to the Loco Hills area, centered the attention in the Southeast New Mexico district during the past week.

The wildcat location for Eddy County was J. Harris' No. 1 fee, 330 ft. from the south and 2,310 ft. from the west lines of Section 20-20-23. The location is in the extreme western part of Eddy County. Chaves County's new wildcat is Stanfield's No. 1 Vogel, 330 ft. from the north and 2,310 ft. from the east lines of Section 27-13-25. Rotary is being rigged up for immediate drilling at the latter test. The Chaves County test is in the southern part of the county and 18 miles south and slightly east of Roswell.

East of the Loco Hills pool, Kersey & Co.'s No. 1 Creek, wildcat discovery of 2 weeks ago, flowed 300 bbl. of oil through casing in 12 hours after a shot. Pay section was logged from 3,264 to 3,280 ft., 1 ft. off bottom. The discovery is located 330 ft. north and 1,650 ft. from the west lines of Section 23-18-30. It is expected later to link with Loco Hills.

In the recently discoverey High Lonesome pool, Eddy County, Powell & Matthews' No. 1 Leonard-Levers, 1,980 ft. from the south and west lines of Section 33-16-29, is testing at a total depth of 2,265 ft., in lime. It is showing approximately 4,300,000 cu. ft. of gas daily, the section having been topped at 2,235 ft. Dodson Drilling Co.'s No. 1 A. H. McElrath, wildcat test 2½ miles northeast of the discovery well in the High Lonesome pool, is shut down for repairs at a total depth of 2,370 ft. Showings of sweet gas amounting to 175,000 cu. ft. were found in sand at 2,357 ft.

SOUTHEAST NEW MEXICO COMPLETIONS

(24-hour gages)

Eddy County

A wildcat, Kersey & Co.'s No. 1 Creek, 330 ft. from the north and 1,650 ft. from the west lines of Section 23-18-30, flowed 300 bbl. of oil through casing in 12 hours from pay shot with 50 qt. from 3,264 to 3,280 ft.

In the Grayburg-Jackson area Repollo Oil Co.'s No. 7-A Parke, Section 15-17-30, flowed 151 bbl. daily after acid in pay from 3,282-3,444 ft. In the Loco Hills pool R. W. Fair's No. 1 Watson & Smith, SE cor. Section 4-18-29, flowed 220 bbl. through casing in 1 hour and 55 minutes from pay shot with 80 qt. from 2,530 to 2,550 ft.

Gordon M. Cone's No. 2 Langford, NE SW Section 9-18-30, flowed 600 bbl. daily from pay shot with 100 qt. from 2,480 to 2,498 ft.

Lea County

In the Vacuum pool Phillips Petroleum Co.'s No. 35 Santa Fe, Section 33-17-35, flowed 22 bbl. hourly after it was acidized from 4,453 to 4,623 ft., total depth. Magnolia Petroleum Co.'s No. 50 State-Bridges, 660 ft. from the south and 1,980 ft. from the west lines of Section 12-17-34, flowed 120 bbl. in 6 hours from pay, shot with 250 qt. at 4,635-4,705 ft. In the South Lovington pool Stanolind Oil & Gas Co.'s No. 3-E State, tract No. 18, flowed 192 bbl. daily from pay acidized from 4,790 to 4,972 ft. In the Halfway pool Argo Oil Co.'s No. 1 Texas Co.-State, NW SW Section 16-20-32, pumped 45 bbl. in 8 hours from pay section acidized at 2,654-57 ft. Argo Oil Co.'s No. 1 Texas Co.-Humphreys, NE SE Section 17-20-32, was dry and abandoned at 2,690 ft.

In the Lovington pool Amerada Petroleum Corp.'s No. 5-L.A. State, Section 1-17-36, flowed 118 bbl. in 5 hours from pay acidized with 4,774 to 4,950 ft. In the Cooper-sand pool Anderson-Prichard Oil Corp.'s No. 4 Stuart, Section 11-25-37, 3,330-3,447 ft., flowed 126 bbl. in 14 hours after shot. Anderson-Prichard Oil Corp.'s No. 11 Wells, Section 4-25-37, 3,480-3,518 ft., flowed 284 bbl. in 8 hours after shot. Skelly Oil Co.'s No. 3-M State, Section 32-24-37, 3,424-3,550 ft., flowed 378 bbl. in 11½ hours, naturally. Stanolind Oil & Gas Co.'s No. 2-A Myers, Section 22-24-37, 3,355-3,570 ft., flowed 26 bbl. in 2 hours after shot.

In the Skelly pool J. C. Clower's No. 4 Christmas, Section 22-22-37, 3,577-3,678 ft., flowed 76 bbl. daily after shot.

In the Maljamar pool Barney Cockburn's No. 4-B Baish, Section 27-17-32, 3,827-85 ft., flowed 331 bbl. in 21 hours after shot.

In the Eunice pool Drilling & Exploration Co.'s No. 2-F State, Section 19-21-36, 3,880-3,950 ft., flowed 76 bbl. in 11 hours after acid.

In the Vacuum pool Drilling & Exploration Co.'s No. 3-O State, Section 34-17-34, 4,395-4,630 ft., flowed 100 bbl. daily, naturally. Humble Oil & Refining Co.'s No. 11-K State, Section 28-17-35, 4,365-4,640 ft., flowed 240 bbl. in 5 hours, naturally.

In the Hardy pool Drilling & Exploration Co.'s No. 1 M. Owens, Section 34-21-37, 3,670-3,740 ft., flowed 75 bbl. daily after acid.

In the Penrose pool Magnolia Petroleum Co.'s No. 6 Brunson-Argo, Section 10-22-37, 3,630-3,727 ft., flowed 60 bbl. in 4 hours after shot. Repollo Oil Co.'s No. 7 State, Section 12-22-36, 3,690-3,761 ft., flowed 380 bbl. daily, naturally.

In the Halfway pool Westlea Oil Co.'s No. 1-C Cleveland, Section 21-20-32, plugged and abandoned at total depth of 2,672 ft.

Chaves County

A wildcat, Meither and others' No. 1 Smith, Section 30-11-25, dry and abandoned at total depth of 836 ft.

NORTHWEST NEW MEXICO

San Juan County

The Angel Peak Oil Co.'s No. 8 Government, C NE SW Section 13-28n-11w, Kutz Canon district, was completed at 1,955 ft. for 1,800,000 cu. ft. of gas per day.

Southern Union Prod. Co.'s No. 6 Gov't., SE SE SE Sec. 14-28n-11w. Drlg. below 2,000 ft.

UTAH

Grand County

Big Six Oil Co.'s No. 1 Gov't, SE¼ Sec. 23-22s-19e. T.D. 100 ft.; cmtd. 8¼-in. at 80 ft.

Cane Creek Oil Co.'s No. 2 Shaffer, NW SW SW Sec. 31-26s-21e. T.D. 3,360 ft.; M.I. equip. for pump tst.

Daggett County

Mountain Fuel Supply Co.'s No. 4 Murphy, SW SE SW Sec. 21-3n-24e. Drlg. 5,332 ft.

Summit County

Longwell Pet. Co.'s No. 1 SE SW SE Sec. 35-3n-5e. T. D. 3,216 ft. in sh.; U.R. 6¼-in. to bttm.

COLORADO

Larimer County

The Continental Oil Co.'s No. 1 Meyer, SW SE SW Section 9-8n-68w, in the Fort Collins field, an old well completed in the Muddy sand in 1925 at 4,437-90 ft. for 200 bbl. per day, and which was deepened the past fall to test the Sundance, and resulted in a discovery in the Dakota sand, was given a pumping test the past week and made 300 bbl. of oil and 50 bbl. of water in 24 hours. The test was carried to a total depth of 5,206 ft., and had water at 5,063-5,202 ft. It was plugged back to the Dakota, logged at 4,658-83 ft., and was shot with 20 qt. at 4,464-4,686 ft., the plugged depth. It swabbed 187 bbl. in 7 hours, and then 25 bbl. an hour through the casing without lowering the fluid level below 3,100 ft. The deep-discovery oil is a black 31.6-gravity crude. The Meyer well was the first test of horizons below the Muddy, and while the proven area probably will be limited, the company ultimately will deepen other wells to the new pay. It is the first commercial producer in the Dakota east of the mountains in Colorado.

WYOMING

Big Horn County

The Yale Oil Corp. is moving in rotary for a well on the east side of the Garland dome in Lot 53, approximately Section 34-55n-97w. Final location will be given later.

Fremont County

F. F. Hintze is starting a test in the Spring Creek district in his No. 1 Government.

Natrona County

While the Salt Creek field officially went under a unit operating agreement on September 1, it will be early in the spring before the plans for operating it as a single unit will be fully effective. Much work already has been done by the Stanolind Oil & Gas Co., which has the operating contract, but most of this is of a preliminary nature. Approximately 1,001 wells are now on production and gas is being injected into the second Wall Creek sand through 191 input wells. The field had 145 separate producing tracts in the unitized area, and these all had tankage on the leases to which oil was run for gaging purposes. The doing away with lease boundaries will obviate the necessity for many of these, and will enable a regrouping. The unitized area now embraces 95.1 per cent of producing acreage in the field. Pipe-line runs at present do not reflect the improvement so far made. This is due to the fact that most of the oil in field tanks was run to storage before the operating agreement became effective, and crude is now being run back into them to restore normal conditions.

A few wells in the first Wall Creek have been acidized for experimental purposes, and these showed an increase of 50 to 100 per cent in initial production. A study of these wells is being made to determine the effect over a considerable period of time. Some tests also have been drilled between oil wells to the second Wall Creek to determine sand conditions, and these showed that approximately 80 per cent of the original saturation is still in the sand. Recycling of this sand will continue on an increasing scale as the gas becomes available. The gas from the field is ample for some time to come, the quantity being used for fuel being less than that produced. The estimated gross cost of producing wells on the Midwest Oil and Mountain producers leases for the first 3 months of operation under the unit is more favorable than prior to that time. Wells of other companies which came into the agreement are being studied. The Government leases under the agreement are to be extended for the life of the field. The Government's royalty is based on a new scale ranging from 12.83 per cent maximum down to 5 per cent minimum to cover the unitized area. The state-owned section now is a part of the unit. When Salt Creek is another year older operators in other large stripper fields which have been fully developed will find this unit an object of interesting study.

Sweetwater County

The Sinclair-Wyoming Oil Co.'s No. 88-A, NW SE SW Section 11-26n-90w, Lost Soldier field, swabbed 30 bbl. of oil and 2 bbl. water in 8 hours at 2,046 ft., and then was deepened to 2,066 ft., where it swabbed 60 bbl. in 4 hours. It is a completion.

Niobrara County

Lance Creek had one completion, an inside well, in the Continental Oil Co.'s No. 5-B Dielman, NW SE NE Section 7-35n-65w, which flowed 1,400 bbl. per day at

5,375 ft., total depth, through the 2-in. tubing at 5,329 ft., after acidizing with 1,000 gal. It had the top of the Leo at 5,342 ft.

Several drilling wells have had to shut down temporarily on account of water shortage.

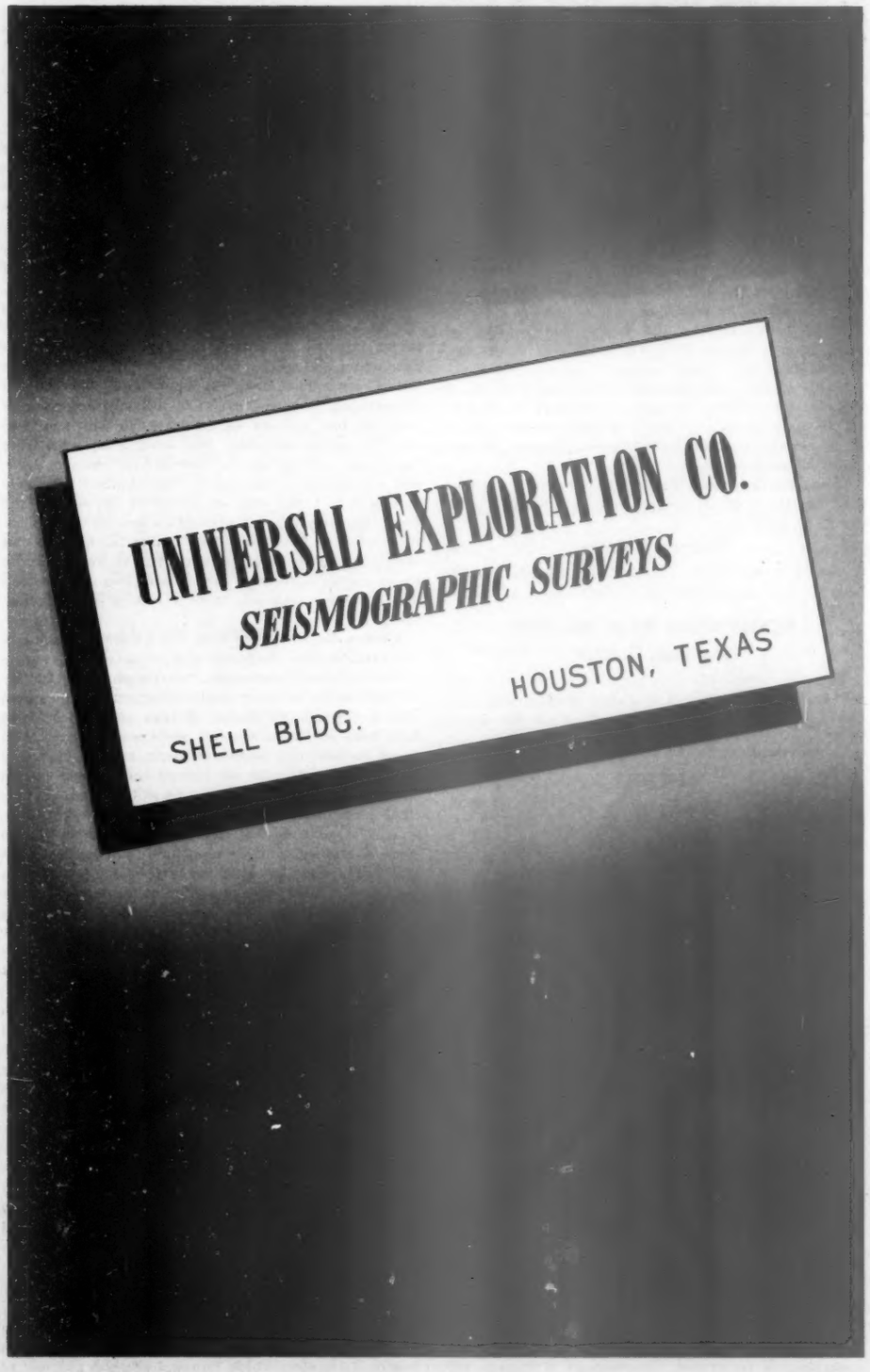
Weston County

Osage had three completions, one a dry hole, and two new operations. Wheedon Oil Co.'s No. 22, C SW SW Section 16-46n-63w, pumped 3 bbl. per day from sand at 210-15 ft. Hugh Updike's No. 4 CEL NE NE Section 36-46n-64w, pumped 20 bbl. per day from sand at 1,548-61 ft. The Osage Trust Co.'s No. 5, SW SE NW Section 13-46n-64w, was dry to 1,360 ft. Charles F. Martens' No. 21, NW NE NE Section 19-46n-63w, had enough saturation in sand at 1,270-79 ft. to warrant shooting, and is a near-completion.

MONTANA

Carbon County

An oil discovery in the Dakota sand on the Montana side of the Elk basin field is reported in the Minnelusa Oil Corp.-Henderson Producing Co.'s No. 1-H-11 Elk 11, SE SE NW Section 35-9s-23e. While at present it appears to be a small well, it indicates that oil will be found in the Dakota sand in this field where wells are low enough on structure to miss the gas. It was drilled to 2,877 ft. and cored 10 ft. of saturated sand which is estimated at 8 to 10 bbl. a day. It is swabbing and cleaning out and getting ready for a Government test. The Elk basin field was discovered in 1916, and has produced around 11,000,000 bbl. of light oil from sands in the Frontier. Five wells drilled to the Dakota on the Wyoming side produce gas. The Frontier horizon is approaching the exhaustion point, but there are a number of untested sands which hold out considerable promise for future development. The new well is an offset to an old producer in the Frontier and a little lower on structure than the gas wells in the Dakota. It was drilled to 1,810 ft. by the Henderson company, and had a show of oil in the Frontier. It was then deepened by the Minnelusa company under contract.



Glacier County

The Glacier Production Co.'s No. 2 Rigney, C SE SW Section 35-36n-6w, in the Cut Bank field, is reported to have come in for an estimated gas flow of 80,000,000 cu. ft. per day. Verification of the report is not yet obtainable, but circumstances point to the probability of bringing in a big well. This well had the top of the Moulton sand at 2,910 ft. and blew in while drilling at 2,914 ft. It gaged 31,000,000 cu. ft. from that horizon. It was then killed and the 8⅝-in. was set at 2,897 ft. with 50 sacks. Drilling was resumed with the hole full of heavy mud, and continued to 2,970 ft., where it reached the top of the Cut Bank sand. The 7-in. was cemented on bottom, and at last report it was ready to drill into the Cut Bank sand. The well is at the extreme north end of the Cut Bank oil field, and apparently some freakish condition exists. It is a west offset to the same company's No. 1 Hall, which was completed in 1935 for 312 bbl. of oil per day in the Cut Bank sand on a swabbing test. The Sunburst sand in this well was dry. It is a south offset to No. 2 Hall, which had some gas and a show of oil in the Moulton sand, and 1,200 ft. of oil in the upper Cut Bank. Three-fourths of a mile to the north the Glacier Co.'s No. 1 Larson, completed early this year, swabbed 105 bbl. in 12 hours from the Sunburst sand, and 165 bbl. first 24 hours from the Cut Bank, being the first well in the field to produce from two horizons at the same time.

Liberty County

Coolidge & Coolidge's No. 1 Forseth, CEL SE NE Section 8-35n-4e, on the Eagle Structure, in the Sweetgrass Hills district, was plugged and abandoned at 1,702 ft. It went directly into the granite out of the Colorado shale.

Toole County

The Kevin-Sunburst field had one near-completion and three new operations. Dr. Boris A. S. Aronow's No. 3 Ellingson, NW SE SE Section 15-35n-3w, on the west side of the field, came in as a flowing well in the contact at 1,738 ft., but no gage has been taken. It had 1,500,000 cu. ft. of gas in the Sunburst at 1,505-25 ft.

Morton & Shaw's No. 2 Ellingson, SE NE NW Sec. 23-35n-3w. Drlg. 200 ft.
Superior Pet. Co.'s No. 3 Haugen, C NE NE Sec. 11-35n-3w. Spdg. 20 ft.
A. Beardslee's No. 12 Swears, CSL SE NW Sec. 9-35n-2w. Spdg.

SOUTH DAKOTA

Harding County

South Dakota State Roy. Co.'s No. 1 State, SW NW Sec. 35-18n-1e. S.D. indef. 7,521 ft.

Indiana Fields

(Continued from Page 338)

ner, SE NW SE Section 21-3s-12w, rig up. Troy Refining Co.'s No. 4 Anderson, 1,000 ft. from south and 150 ft. from west lines of SE NE Section 11-6s-4w, spudded.

In Posey County C. J. Evans' No. 1 Martin, SE SW SW Section 3-5s-12w, was dry and abandoned at 875 ft. Superior Oil Co.'s No. 17 New Harmony, SW NE SE Section 9-5s-14w, Waltersburg sand at 2,174 ft., total depth 2,203 ft., pumped an estimated 300 bbl. per day. Hollingsworth and others' No. 1 Keck, NE cor. SE NW Section 34-3s-14w, shot with 10 qt. at 2,143-53 ft., 156 bbl. per day on the pump. New work included Joe Minton and others' No. 1 Hill, NW SW NW Section 7-4s-13w, location. Brown, Ryan and others' No. 1 Spencer, C E½ SE SE Section 26-7s-15w, location. Superior Oil Co.'s No. 19 New Harmony, NW NW SW Section 10-5s-14w, rig up. Superior's No. 20 New Harmony, NW NW NW Section 15-5s-14w, location. Superior's No. 18 New Harmony, SE NE SE Section 9-5s-14w, rig up. Roberts Brothers' No. 3 Keck, C N½ N½ NW¼ Section 34-3s-14w, rig up. J. E. Crosbie, Inc.'s No. 4 Keck, SW cor. NW NW NE Section 34-3s-14w. rig up.

Horton & Wiggins' No. 1 State Life Insurance Co., SW SW NW Section 14-1s-12w, in Knox County, was drilling at 2,380 ft. in gray lime with a strong sulfur odor. Ste. Genevieve. lime was topped at 2,304 ft.

E. L. Shoudy and others' No. 2 Osburn heirs, NE cor. NW SW SE Section 12-8n-10w, Sullivan County, was completed at 800-01 ft. It started at 8 bbl. per day with 2 bbl. of water. Niagaran Oil Co.'s No. 1 Knowles, SE SE NW Section 6-8n-9w, found water in the Niagara lime at 2,425-29 ft., top of the lime 2,319 ft., and was abandoned.

In Hancock County John M. Seip was drilling at 200 ft. in No. 1 Brock, 330 ft. from west and 50 ft. from south lines of Section 6-16n-6e. Seip abandoned the location for No. 1 Steel, in NE NW NE Section 7-16n-6e.

California Field Report

By L. P. STOCKMAN

Extend Dominguez Westerly; Big Well in Coalinga District

LOS ANGELES, Calif., Dec. 26.—R. E. Havenstrite and Union Oil Co. separately extended the Dominguez field to the west. The former's No. 1 Larronde was completed flowing 1,040 bbl. of 31.9-gravity oil cutting 3 per cent from 7,500 ft. No. 73 Callender of Union Oil Co., an east offset of No. 1 Larronde, flowed 1,065 bbl. of 31.6-gravity oil and 600,000 cu. ft. of gas through a 32/64-in. bean from the eighth Callender zone with bottom of the hole at 7,460 ft.

In the northwestern end of the field Union Oil Co. completed No. 74 Callender flowing 245 bbl. of 31.8-gravity oil cutting 5 per cent through a 42/64-in. bean. The well was bottomed at 7,637 ft. but plugged back to 7,117 ft. It logged saturated oil sand at 6,880-7,189 ft. but evidence of severe faulting was noted below 7,190 ft. with some steep dips even above this point.

Montebello

Rainbow Petroleum Co. completed No. 1 Crawford in the Montebello extension flowing 960 bbl. of relatively clean 35.8-gravity oil and 1,480,000 cu. ft. of gas per day from La Merced zone at 7,595 ft. Sunset Oil Co. completed No. 1 Robinson flowing 720 bbl. of 36.2-gravity oil cutting 2 per cent and 950,000 cu. ft. of gas daily from La Merced zone, top of the oil sand 7,480 ft., bottom of the hole at 7,600 ft. Fremont Oil Co.'s No. 1 Aldrich was brought in flowing 386 bbl. of 36.2-gravity oil and 1,000,000 cu. ft. of gas from 7,580 ft. Top of the sand was 7,490 ft. No. 2 Fremont was finished flowing 425 bbl. of clean 35.9-gravity oil and 1,100,000 cu. ft. of gas from 7,605 ft.

Golden Eagle Oil Co.'s No. 1 Lehman was completed flowing 375 bbl. of 35.8-gravity oil and 900,000 cu. ft. of gas from La Merced zone at 7,653 ft., and No. 2 Lehman was finished flowing 445 bbl. of clean 36.1-gravity oil and 800,000 cu. ft. of gas daily from the same zone with bottom of the hole at 7,644 ft., with productive formation at 7,429-7,651 ft.

Wilmington

In the Wilmington field 10 new derricks are up and locations have been staked for six additional new wells. Union Pacific Railroad Co. is driving piles for two wells and derrick up for No. 129. This company is at present running six strings of tools and the new locations being made are to take the place of new wells as they are completed.

Brookline Oil Co. completed No. 1 Donnie in the southern end of the Long Beach Harbor section, flowing 430 bbl. of 17.2-gravity oil, cutting 4 per cent. through a 36/64-in. bean from the Ranger zone with bottom of the hole at 3,698 ft. with pipe perforated at 3,010-3,240 ft., 3,410-3,605 ft., and 3,635-98 ft. Dumm Brothers Petroleum Co. completed No. 4 Harbor in the Wilmington field flowing 245 bbl. of 15.3-gravity oil through a 32/64-in. bean from the Ranger zone, with bottom of the hole at 3,475 ft. L. A. Basin Drilling Co.'s No. 3 Kupfer, in the older section of the field, flowed 142 bbl. of 15.3-gravity oil per day from the Ranger zone at 3,595 ft. No. 7-B Nelson of Royalty Service Corp. at Pioneer and E streets in the townlot area was bottomed in basement schist at 6,902 ft. but has been plugged back to the Ford zone at 5,756 ft. No showings were found below the base of the Ford zone.

Ten Section

Shell Oil Co., Inc., which to date is the only operator to develop commercial production in the Ten Section field of Kern County which it discovered a few years ago, completed two additional wells this week. No. 61-25-A Kern County Land in Section 25-30-25 was finished flowing 2,514 bbl. of clean 35.4-gravity oil and 1,563,000 cu. ft. of gas daily through two 1-in. beans from the Stevens zone with bottom of the hole at 8,200 ft. Pipe was perforated at 8,040-75 ft. and 8,120-97 ft. This new well extends production one location to the west. Shell's No. 32-28-B Kern County Land in Section 28-30-26 flowed 1,890 bbl. of clean 34.4-gravity oil and 1,220,000 cu. ft. of gas through two 1-in. beans from the Stevens sand with bottom of the hole at 8,220 ft., with liner perforated at 8,050-8,105 ft. and 8,130-8,217 ft. Top of the Stevens oil sand was cored at 8,026 ft.

Rosecrans

In the South Rosecrans field No. 1 Santa Fe, a joint wildcat of Barnsdall Oil Co. and Wilshire Oil Co., tested wet and has been recemented. Bottomed in a promising oil sand at 8,792 ft. the hole has been recemented at the shoe of the 7-in. at 8,788 ft. No. 18 Trust, a semi-wildcat, was completed a few days ago flowing 183 bbl. of 36.5-gravity oil per day from 7,735 ft., plugged back from 7,824 ft. and pipe perforated at 7,380-7,575 ft. and 7,610-7,735 ft.

Coalinga

Superior Oil Co. extended the Southeast Coalinga field 1,650 ft. to the northwest by completing No. 1-B Cagle in Section 6-20-16 flowing 4,440 bbl. of clean 32.1-gravity oil and 2,607,000 cu. ft. of gas daily from the Gatchell zone of Eocene age with bottom of the hole at 8,119 ft. It is the most northwesterly producing well in the Southeast Coalinga field and has narrowed the intervening distance between the Northeast and Southeast fields. Wilshire Oil Co. failed to develop production in No. 64-30-B in Section 30-19-16 about midway between the two fields although a promising oil sand was logged above the bottom of the hole at 8,383 ft. Bandini Petroleum Co., a subsidiary of Wilshire Oil Co., is drilling in the same section and should reach the top of the Gatchell zone within the next 2 weeks as the bit is already below 6,000 ft.

R. S. Lytle, operating for Seaboard Oil Co., Honolulu Oil Co., and former stockholder of Petroleum Securities Co., completed No. 26-18-F in Section 18-20-16 flowing 3,111 bbl. of 31.9-gravity oil and 2,000,000 cu. ft. of gas from the Gatchell zone at 7,672 ft. It logged top of the Kreyenhagen at 6,005 ft., top of the Glauconitic at 7,115 ft., top of the Gatchell zone at 7,170 ft., and base of the Gatchell oil sand at 7,661 ft. Perforations of 100-mesh were at 7,180-7,396 ft., 7,435-

(Continued on Page 344)

TANKER SHIPMENTS FROM LOS ANGELES TO DOMESTIC AND FOREIGN PORTS

	December 17		December 10			
Intercoastal-domestic—	Total this week	Daily average	Total last week	Daily average	This year to date	Same time last year
Crude oil	.....	.....	.....	.....	918,539	924,037
Fuel oil	.....	.....	68,260	9,751	2,100,141	200,201
Diesel and gas oil	.....	.....	.....	.....	163,501	.....
Gasoline	.....	.....	221,874	31,696	3,494,361	2,879,623
Kerosene	.....	.....	.....	.....	225,197	333,626
Foreign exports—						
Crude oil	248,296	35,471	233,173	33,310	14,728,975	20,643,019
Fuel oil	318,941	45,563	46,930	6,704	8,646,314	8,923,831
Diesel and gas oil	183,809	26,258	96,467	13,781	7,767,649	5,538,395
Gasoline	114,273	16,325	56,808	8,115	7,029,867	7,889,875
Kerosene	31,476	4,497	.....	.....	1,830,056	1,139,735
Asphalt	.....	.....	.....	.....	.....	7,563
Lubricants	.....	.....	.....	.....	165,166	175,560
Coastwise-domestic—						
Crude oil	260,143	37,163	120,182	17,169	12,092,566	10,989,215
Fuel oil	218,726	31,247	293,811	41,973	10,232,346	11,895,551
Diesel and gas oil	34,211	4,887	66,494	9,499	2,225,094	1,208,369
Gasoline	302,388	43,198	677,315	96,759	16,145,576	14,103,198
Kerosene	16,550	2,364	10,651	1,522	192,790	249,264

TANKER SHIPMENTS FROM SAN FRANCISCO TO DOMESTIC AND FOREIGN PORTS

Intercoastal-domestic—						
Fuel oil	.....	.....	.....	.....	188,882	.....
Diesel and gas oil	72,496	10,357	.....	.....	386,588	251,560
Gasoline	.....	.....	.....	.....	43,235	25,409
Kerosene	.....	.....	.....	.....	100,507	16,124
Asphalt	.....	.....	.....	.....	501,323	490,039
Lubricants	.....	.....	.....	.....	24,870	19,945
Foreign exports—						
Crude oil	46,788	6,684	.....	.....	5,444,932	5,036,402
Fuel oil	61,484	8,783	30,192	4,313	2,949,552	2,405,862
Diesel and gas oil	16,411	2,344	49,623	7,089	2,666,589	3,052,566
Gasoline	58,112	8,302	.....	.....	3,001,289	5,167,496
Kerosene	77,965	11,138	.....	.....	632,554	696,099
Asphalt	.....	.....	.....	.....	22,323	56,258
Lubricants	17,428	2,490	.....	.....	642,722	534,142
Other finished oil	.....	.....	.....	.....	815	.....
Coastwise-domestic—						
Fuel oil	130,606	18,658	161,429	23,061	6,204,530	6,424,824
Diesel and gas oil	40,255	5,751	80,136	11,448	1,359,849	1,541,280
Gasoline	210,167	30,024	200,288	28,613	7,778,335	7,584,416
Kerosene	20,215	2,888	41,165	5,881	978,521	671,809

TOTAL TANKER SHIPMENTS FROM CALIFORNIA TO DOMESTIC AND FOREIGN PORTS

Intercoastal-domestic—						
Crude oil	.....	.....	.....	.....	918,539	924,037
Fuel oil	.....	.....	68,260	9,751	2,289,023	200,201
Diesel and gas oil	72,496	10,357	.....	.....	550,089	251,560
Gasoline	.....	.....	221,874	31,696	3,537,596	2,905,032
Kerosene	.....	.....	.....	.....	325,704	349,750
Asphalt	.....	.....	.....	.....	501,323	490,039
Lubricants	.....	.....	.....	.....	24,870	19,945
Foreign exports—						
Crude oil	295,084	42,155	233,173	33,310	20,173,907	25,679,421
Fuel oil	380,425	54,346	77,122	11,017	11,595,866	11,329,693
Diesel and gas oil	200,220	28,603	146,090	20,870	10,434,238	8,590,961
Gasoline	172,385	24,626	56,808	8,115	10,031,156	13,057,371
Kerosene	109,441	15,634	.....	.....	2,462,610	1,835,834
Asphalt	.....	.....	.....	.....	22,323	63,821
Lubricants	17,428	2,490	.....	.....	807,888	709,702
Other finished oil	.....	.....	.....	.....	815	.....
Coastwise-domestic—						
Crude oil	260,143	37,163	120,182	17,169	12,092,566	10,989,215
Fuel oil	349,332	49,905	455,240	65,034	16,436,876	18,320,375
Diesel and gas oil	74,466	10,638	146,630	20,947	3,584,943	2,749,649
Gasoline	512,555	73,222	877,603	125,372	23,923,911	21,687,614
Kerosene	36,765	5,252	51,816	7,402	1,171,311	921,073

North Louisiana, Arkansas

By GEORGE WEBER

Magnolia Pool Outpost Did Not Respond to Early Tests

SHREVEPORT, La., Dec. 26.—Protracted work on Standard Oil Co. of Louisiana's No. 1 Petty Stave Lumber Co., Columbia County wildcat in South Arkansas, failed to bring in the prospective new Smackover-lime field discovery last week. The test was bottomed at 7,999 ft., with 6-in. casing set at 7,989 ft. It swabbed brackish water. Operators plugged off the bottom to the casing seat and perforated this week at 7,985-87¾ ft. and swabbed to 6,000 ft. after washing. The well would not flow, and after it was swabbed down to 7,200 ft. it showed no oil. The casing is being reperforated at 7,980-88 ft. for another production test. This wildcat topped the Buckner formation at 7,736 ft., the Smackover lime at 7,943 ft. and porous lime at 7,956 ft. On a drill-stem test several days ago it showed gas-cut mud and a good recovery of distillate at 7,935-40 ft. It is northwest of the city of Magnolia.

The Dorcheat, Atlanta and Buckner fields of Columbia County were active, with extension tests under way. In Atlanta J. K. Mahoney's No. 1 Emma Riley, a northeast outpost, over 1 mile from production in the field, topped the Smackover lime at 8,145 ft. and the porous zone at 8,156 ft., and the crew set casing, with total depth at 8,240 ft. The Smackover was topped 36 ft. higher in this outpost than in the discovery well to the southwest. A north offset to production, H. L. Hunt's No. 1 McWilliams topped Smackover lime at 8,210 ft. and the porous lime at 8,229 ft., 20 ft. lower than the well to the south, and has drilled to within 1 ft. of the water table according to data on the south offset, and is completed for the third well in the field.

In the Dorcheat field, an east offset to the discovery, Lion Oil Refining Co.'s No. 1 Warnock estate, topped the Smackover lime at 8,788 ft. and the main porosity at 8,808 ft., 8 ft. lower than the first porosity in the discovery well. Four other wells, in north, south, east and northeast offset locations are in or closely approaching the Smackover lime, and a wildcat 16 miles north and 4 miles west of discovery is drilling for the formation.

The Buckner field's east-edge test, Standard Oil Co.'s No. 1-B Johnson flowed oil before going dead in the porous lime, and further completion attempts will be made.

Lisbon Well

Lisbon Exploration Co.'s No. 1 Vaughn, new lower Marine discovery in the Lisbon field was given an official gage of 64 bbl. of condensate averaging 53.9-gravity, and an estimated 3,000,00 cu. ft. of gas daily through a ⅝-in. bottom-hole choke at 5,000 ft., and a 5/16-in. choke at the top of the tubing. Tubing pressure was 1,500 lb. and casing pressure 2,800 lb. The well is being shut in pending a series of tests to be made by the Black, Sivalls & Bryson, Inc., well-testing unit.

Pine Island is again in the spotlight, as Stanolind Oil & Gas Co. tests a slight show of oil and gas in the deep well. The casing, set at 10,154 ft. was ripped this week at 6,963-7,060 ft. and tested over 13 stands of fluid and mud with a little show of oil and gas, using ¾-in. chokes top and bottom in 22 minutes. Further tests will be made after tubing is run.

In De Soto Parish, N. W. Hunter's No. 1 Anders-LeBlanc continues to fish for drill stem while trying to blow out with high-pressure gas at 4,818 ft.

Mississippi Activity

Another producer for the Tinsley field, in Yazoo County, Mississippi, Union Producing Co.'s No. 3 Woodruff was expected to be the eighth producer for the field. Wildcatting throughout the state continued strong, with new tests making progress. Grasty's No. 1 Kentucky Lumber Co., in Itawamba County, northeastern Mississippi, is changing over to cable tools at 1,794 ft. in Trenton lime, having missed the Pennsylvanian. The well is running very high according to subsurface geological knowledge of the area and interest is strong in the test, which will get under way again shortly after January 1.

NORTH LOUISIANA COMPLETIONS

Bellevue—Bossier Parish

Cary & Gibson's No. 2-A Connell, Section 15-19-11, pumping 5 bbl. of oil and considerable water, total depth 404 ft.

Sligo—Bossier Parish

Triangle Drilling Co.'s No. 4-A Herold, 1,001 ft. E, 333 ft. S of NW cor. Section 13-17-12, 251 bbl. of oil through open tubing, 5½-in. casing set at 2,998 ft., total depth 3,018 ft.

Caddo—Caddo Parish

S. H. Cassidy's No. 1 Morgan, Section 2-20-16, pumping 15 bbl., total depth 1,560 ft. Jones Oil Co.'s No. 1 Ober, Section 1-20-16, heading 140 bbl. through open tubing, total depth 1,490 ft. J. Ray Murray's No. 1 Barfield, Section 21-21-15, 50 bbl. of oil, no salt water, total depth 1,650 ft. Seymore Oil Co.'s No. 1 Hughes, Section 15-20-15, abandoned, would not pump, total depth 2,206 ft. Temple Oil Co.'s No. 1 Huckaby-Parker, Section 13-22-16, pumping 125 bbl., total depth 2,626 ft.

Lisbon—Claiborne Parish

Lisbon Exploration Co.'s No. 1 Roberta Vaughn, 330 ft. N, 660 ft. E of SW cor., NW NE Section 36-21-5, total depth 8,900 ft. Plugged back and perforated at 8,444-64 ft., flowed 64 bbl. of 53.9-gravity condensate and an estimated 3,000,000 cu. ft. of gas, through ⅝-in. bottom-hole choke and 5/16-in. tubing-head choke, tubing pressure 1,500 lb., casing pressure 2,800 lb.

Wildcat—De Soto Parish

Murray David's No. 1 Russell, 50 ft. N, 500 ft. of W SE cor., NE NW Section 12-11-16, dry and abandoned at 1,840 ft.

Urania—La Salle Parish

Smith Brothers' No. 1 Kenney, 320 ft. S, 161 ft. W of NE cor. SW SW Section 7-10-2e, pumping 5 bbl. of oil and considerable salt water, total depth 1,527 ft.

Zwolle—Sabine Parish

A. C. Phillips' No. 1 Frost Lumber, 330 ft. NE cor. Section 34-10-13, pumping 100 bbl. fluid, 50 per cent salt water, total depth 1,952 ft. H. M. Sneed's No. 1 Leone, 330 ft. N, 400 ft. E of SW cor., NW SE Section 8-7-13, pumping 5 bbl., total depth 2,116 ft.

Monroe—Union Parish

Interstate Natural Gas Co.'s No. 96 fee, Section 26-22-3, 1,000,000 cu. ft. of gas, rock pressure 1,020 lb., total depth 2,202 ft. Memphis Natural Gas Co.'s No. 5 Frost Lumber, Section 11-22-3, 1,000,000 cu. ft. of gas, rock pressure 1,020 lb., total depth 2,204 ft.

Cotton Valley—Webster Parish

Woodley Petroleum Co.'s No. 2 Couch, 810 ft. S, 510 ft. W of NE cor. SW¼ Section 35-21-10, 600 bbl., ¼-in. choke, tubing pressure 1,040 lb., casing pressure 1,350 lb., 7-in. casing 8,541 ft., perforated at 8,404-26 ft., in "D" sand, total depth 8,560 ft.

ARKANSAS COMPLETIONS

Champagnolle—Union County

Frank Anthony's No. 1 Jerry, 410 ft. W, 670 ft. N, SE cor., SW Section 21-17-14, salt water and abandoned, total depth 2,692 ft.

Production by Pool

Estimated daily gross production of all companies week ended December 22:

NORTH LOUISIANA

	Bbl.
Bellevue	480
Caddo light	5,120
Caddo heavy	2,400
Converse	500
Cotton Valley	*13,765
Cross Lake	5,365
De Soto and Red River	1,080
Elm Grove	300
Haynesville	2,750
Holly	85
Homer	2,740
Lisbon	5,575
Pleasant Hill	90
Rodessa	22,395
Sarepta-Carterville	†290
Sligo	1,355
Sugar Creek	285
Urania	2,650
Zwolle	2,310
Total	69,535

SOUTH ARKANSAS

Atlanta	500
Buckner	2,600
Champagnolle	1,350
Dorcheat	360
El Dorado	1,700
Lewisville	695
Lisbon	230
Magnolia	20,355
Miller County	290
Nevada	540
Rodessa	2,935
Schuler	18,035
Smackover light	1,870
Smackover heavy	14,550
Stephens	535
Troy	1,250
Urbana	945
Village	1,405
Total	70,145

†100 bbl. is distillate.
Texas side of Rodessa 26,075 bbl.

PANHANDLE CHAIRMAN

GEORGE BERLIN

Head of the production department of Skelly Oil Co. in the Texas Panhandle, new chairman of the Panhandle chapter of the American Petroleum Institute Division of Production.

North and East Texas

By
D. H. STORMONT

Third Pay Opened in Rogers & Rogers Pool in Montague

WICHITA FALLS, Tex., Dec. 26.—Discovery of a third and deepest pay level for the Rogers & Rogers pool of Montague County, opening of a 2,500-ft. pool in Cooke County, and several large acreage sales in the Hull-Silk pool of Archer County, were the principal features of a busy and eventful week in the North Texas district.

Stanolind Oil & Gas Co.'s No. 2 Kate Davis, in the southeast corner of the W. J. Wells Survey, Abstract 844, a failure in both the 4,300-ft. and the 4,600-ft. pay levels, indicated one of the most prolific spots in the county by tapping oil in the Smithwick lime in the Bend series of basal Pennsylvanian. With the hole bottomed at 5,249 ft., packer was set at 5,223 ft. and the well started flowing in 9 minutes through drill stem, and continued to flow through casing for 20 minutes after the tester was closed. Bottom-hole pressure built up to 2,200 lb. Casing was cemented at 5,223 ft. and when plug was drilled the well flowed 80 bbl. of oil the first 30 minutes and continued to flow into tanks at the estimated rate of 150 bbl. hourly until it was shut in for a gage. Several new wells are preparing to commence drilling in the three-horizon pool.

A new producing spot in Cooke County was being hailed as the week closed at Big Indian Oil & Development Co.'s No. 1 M. P. Morton, 5 miles southeast of Gainesville. Bailing the hole failed to lower the oil level below 800 ft. There is no salt water showing and the oil is reported to be heavy and black and about 30° in gravity. Production is from a Strawn sand drilled from 2,509 to 2,517 ft., total depth. The new pool opener is on a 253-acre tract in Section 1, E. T. Survey, Abstract 365.

G. E. Sykes of Ardmore, Okla., has made location for a 3,000-ft. wildcat test in the southwestern corner of the county and on a block assembled by Hill Christian. The well will be No. 1 Christian, 1,000 ft. out of the west corner of the J. P. Bailey Survey, Abstract 70, 3 miles northeast of Rosston.

Several major lease sales of both productive and unproved tracts in both the Hull-Silk pool and the South Mankins Caddo pool were seen for the North Texas district during the week.

One of the trades marked the entrance of Roeser & Pendleton, Inc., Fort Worth, into the South Mankins Caddo pool. The firm purchased 475 acres out of Section 11, Block 3, H.&T.C. Survey, J. R. Parkey lands, 3 miles south of Mankins, for a reported consideration of $95,000, terms to be $47,500 cash and the balance in oil.

Another deal in the Hull-Silk pool was seen when Bert L. Ligon, Wichita Falls, sold the Southern Petroleum Co., Sisterville, W. Va., an 80-acre lease out of Lots 8 and 12 in Block 29, A.T.N.C.L. Survey, for $310,000. Terms were $250,000 cash and $60,000 in oil. This is the second purchase from Ligon by the West Virginia firm, it having acquired a 40-acre tract out of the S. D. Johnson lands, Section 1, H.T.&B. Survey, about 3 months ago.

EASTERN TEXAS

DALLAS, Tex., Dec. 26.—Assuring more than initial exploration for eastern Texas' deep Trinity discoveries, development, including additional wells and pipe-line outlets, is being planned. Rapid development for Limestone County's recent Glen Rose discovery near Groesbeck is seen as the second well prepares to start. A buyer has been secured for the output of the discovery well and a pipe line is planned from the field. On the Chapel structure in Smith County, Sun Oil Co., in the process of drilling one well, has staked location for a second. Hunt Oil Co., Dallas, driller of the discovery well on the deep structure, has completed and placed in operation a pipe-line outlet for the well's distillate production. A new 8,000-ft. Trinity wildcat is planned for Rusk County and another is getting under way in Red River County. This is by far the most widespread and intensive deep Trinity exploratory and development program ever carried on in eastern Texas.

Murray Samuell of Dallas and Zephyr Oil Co. (S. J. Taylor) of Tyler, drillers of the discovery well in Limestone County's Glen Rose distillate-producing pool, are preparing to spud No. 2 Cannon Barron, ½ mile north and east of the first well. Drill site is on the northeast side of a 320-acre tract in the W. G. McKenzie Survey. Plans are to thoroughly test the 4,600-ft. level which showed oil in the discovery well.

With the support of Lone Star Gas Co., Murray Samuel and Zephyr Oil Co. plan a development campaign for the area. The Lone Star Gas Co. is reported to have advanced $20,000 to the operators and contracted for half interest in the income from the leases. The Lone Star Gas Co. has agreed to take 300,000,000 cu. ft. of gas annually from the lease. It will be piped to Lone Star's main line some 8 miles north of the field. The company is buying right-of-way for the gathering line from the gas well to the trunk running from the Long Lake field. The discovery well is making about 250 gal. of gasoline per 1,000,000 cu. ft. of gas, or based on its initial gage, about 82 bbl. of gasoline daily, together with 13,700,000 cu. ft. of gas. Production is from 5,584 to 5,601 ft.

Another deep wildcat is reported planned for the county by Frank Bryan of Mexia, who has blocked 15,000 acres in the Ben Hur area of Limestone County. The operator is attempting to finance a test to 8,000 ft. West of Thornton in Limestone County, considerable leasing is being carried on with leases selling as high as $2 to $3 per acre. Some leases in the county have been taken at $5 per acre.

In the Chapel Hill area of Smith County, Sun Oil Co., which is drilling a deep test on the southern flank of the structure and south of the Hunt Oil Co. discovery well, is planning a second test on its recently acquired leases. The new drilling block consists of the John A. Manier Survey, the Thomas M. Hawkins Survey and the north 225 acres of the Byrd Chumley Survey. Little definite information concerning the company's second test has yet been released; however, it is not expected to start until the outcome of the present test is known. The company was forced to plug back its No. 1 Huddle when the hole was found to be off vertical. Redrilling was started at 1,000 ft. The No. 1 Huddle is about 2 miles south of the discovery well.

Shell Oil Co., Inc.'s No. 1 Campbell, P. Lively Survey, about 2½ miles north of the discovery well, is bottomed at 7,599 ft. and preparing to run electrical survey and test. Several zones of possible production have been drilled, however, none is considered of any great importance.

Hunt Oil Co. has completed and placed in operation a 3-in. line from its discovery well on the Chapel Hill structure to a loading rack on the I.&G.N. Railroad some 8 miles away. The well's 250 bbl. daily distillate production is being moved through the line while the gas output is being piped to the East Texas field for repressuring uurposes.

EAST CENTRAL TEXAS COMPLETIONS

(24-hour gages)

Houston County

In the Grapeland pool, J. C. Cook's No. 1 B. T. Masters, ½ mile northwest of the pool proper, made 30,000,000 cu. ft. of gas with 30 bbl. of distillate per 1,000,000 cu. ft. of gas. Total depth is 6,060 ft.

Rusk County

A wildcat, Jeff Bolton's No. 1 Hall Wood, J. I. Sanches Survey, 2½ miles northwest of New Salem, junked and abandoned at total depth of 3,225 ft.

NORTH TEXAS COMPLETIONS

Archer County

Blackwell Oil & Gas Co.'s No. 4 L. F. Wilson-Christie, 4,295-4,306 ft., 1,936 bbl. Continental Oil Co.'s No. 5 L. F. Wilson-McCrory, 4,288-4,355 ft., 1,488 bbl. Deep Oil Development Co. and R.G. Drilling Co.'s No. 3 Dr. J. A. Little, 4,327-80 ft., 888 bbl. E. P. Griffin's No. 5 W. T. Waggoner B, 1,658 ft., dry. Bert L. Ligon and others' No. 2 Dr. J. A. Little B, 4,313-65 ft., 1,027 bbl. Peterson & McCarty's No. 31 L. F. Wilson, 4,280-4,340 ft., 1,376 bbl. Petroleum Production Co.'s No. 1 S. D. Johnson and others B, 4,310-43 ft., 1,040 bbl. Shappell Oil Co.'s No. 5 J. L. Jackson D, 675-82 ft., 60 bbl. L. Sikes' No. 5 O. T. Anderson, 4,028-52 ft., 1,600 bbl. Sinclair Prairie's No. 1 R. L. Kempner, 3,755-3,878 ft., 65 bbl. Southern Petroleum Exploration, Inc.'s No. 6 S. D. Johnson, 1,327 ft., dry. Thurmond & Lipscomb's No. 4 L. F. Wilson, 4,280-4,351 ft., 210 bbl. W. B. Hamilton's No. 2 C. E. Graham B, 1,126-33 ft., 88 bbl. W. B. Hamilton's No. 3-A F. C. Green B, 1,130-41 ft., 158 bbl. F. T. Johnson's No. 1 W. E. Brown, 1,425 ft., dry. Kimmell & Woofter's No. 15 Mrs. G. Williams, 575-79 ft., 4 bbl. King Oil Co.'s No. 7 M. E. Rogers, 1,265-78 ft., 10 bbl. Pace Petroleum Corp.'s No. 26 C. L. Abercrombie B, 1,004-20 ft., 10 bbl. Shappell Oil Co.'s No. 5 C. E. Garter, 1,196 ft., dry. G. J. Scholl's No. 1 R. D. Andrews, 963 ft., dry. Shell Oil Co., Inc.'s No. 5 Colgan, 1,446-55 ft., 58 bbl. Wo-Mac Oil Co.'s No. 1 W. P. Harmonson, 902 ft., dry.

Barnes & Traugh's No. 3-A Ray Carson, 1,280-95 ft., 141 bbl. Chapman & McFarlin's No. 2 L. F. Wilson, 4,323-60 ft., 2,400 bbl. W. B. Hamilton's No. 2 C. E. Graham, 1,117-30 ft., 40 bbl. Helmerich & Payne, Inc.'s No. 3 J. N. Shepard, 4,284-4,315 ft., 1,856 bbl. B. M. Hester & Son's No. 1 W. T. Finley, 4,275-4,305 ft., 776 bbl. Edwin B. Hopkins' No. 1 A. Albright, 4,668-85 ft., 1,656 bbl. F. T. Johnson's No. 2 W. E. Brown, 1,423 ft., dry and abandoned. King Oil Co.'s No. 6 M. E. Rogers, 1,261-80 ft., 12 bbl. King Oil Co. and Phillips Petroleum Co.'s No. 5 Wilson, 3,995-4,031 ft., 1,280 bbl. Bert L. Ligon's No. 4 Dr. J. A. Little, 1,380 ft., dry and abandoned. Bert L. Ligon's No. 2 L. F. Wilson C, 4,359-90 ft., 808 bbl. Perkins & Cullum's No. 183 Falls County, 5,065 ft., dry and abandoned. Petroleum Production Co.'s No. 1 Z. M. Perkins, 1,331 ft., dry and abandoned. Petroleum Production Co. and United Production Co.'s No. 4 J. N. Shepard, 4,288-4,308 ft., 1,964 bbl. Phillips Petroleum Co.'s No. 6 A. L. Moss, 4,292-4,332 ft., 1,736 bbl. Shell Oil Co., Inc.'s No. 4 E. Colgan, 1,475 ft., dry and abandoned. L. Sikes' No. 4 O. T. Anderson, 4,372-4,418 ft., 840 bbl.

Baylor County

British American Oil Co.'s No. 5 F. C. Green D, 2,554-58 ft., 570 bbl.

Jack County

Rowan-Nichols Oil Co. and E. L. Wilson's No. 4 John Matlock, abandoned location. Sewell Smith's No. 5 George Edwards, 319-25 ft., 10 bbl.

H. F. Paul's No. 1 L. M. Craig, 312 ft., dry and abandoned. Sewell's No. 2 George Edwards, 326-30 ft., 20 bbl. Sewell's No. 3 George Edwards, 322-35 ft., 11 bbl. Sewell's No. 4 George Edwards, 319-37 ft., 10 bbl.

Clay County

H. I. Manley's No. 1 L. Klein, 1,271 ft., dry. W. H. Metzner's No. 4 C. T. Taylor estate and others, 1,137-85 ft., 321 bbl. W. H. Metzner's No. 5 C. T. Taylor estate and others, 1,163-85 ft., 335 bbl. W. H. Metzner's

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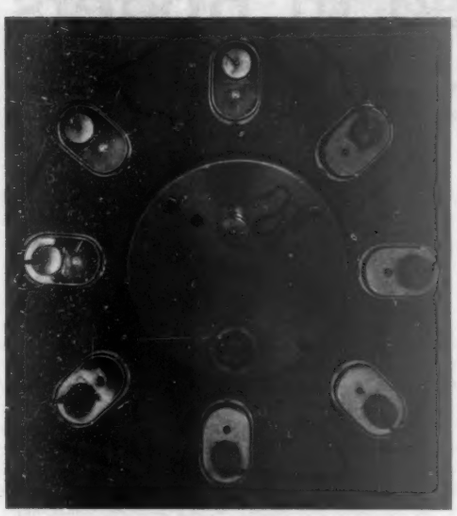

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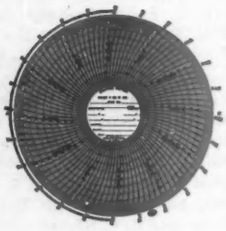

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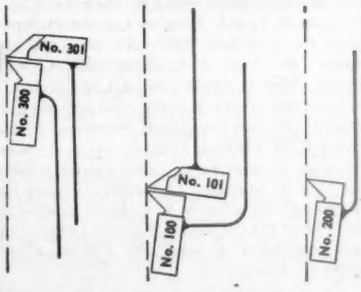

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No. 7 C. T. Taylor estate and others, 1,204 ft., dry.

L. T. Burns' No. 1 J. T. Pickett, 4,430-45 ft., 20 bbl. Continental Oil Co., Superior Oil Co., and A. R. Dillard's No. 1 O. O. Ross, 5,342-5,400 ft., 1,136 ft., wildcat pool opener. Harvey Drilling Co.'s No. 1 C. T. Taylor estate, 1,074 ft., dry and abandoned. W. H. Metzner's No. 6 Taylor & Metzner, 1,231 ft., dry and abandoned. J. M. Tanner's No. 14 G. M. Rigsby, 216-25 ft., 7 bbl.

Cooke County

Magnolia Petroleum Co.'s No. 1 S. L. Ramsey estate, 4,818-42 ft., 1,350 bbl. McDaniel & Beecherl's No. 7 J. Weisman, 742-65 ft., 10 bbl. J. C. Roberts' No. 1 W. M. Trubenbach, 1,655-70 ft., 12 bbl. Sinclair Prairie's No. 4 P. McGeorge, 4,918-63 ft., 541 bbl. Mrs. B. Whatn's No. 2 Voth, 1,792 ft., dry.

Bridwell Oil Co.'s No. 12 J. H. Parkey, 737-48 ft., 61 bbl. C. & L. Oil Co.'s No. 7 J. J. Perkins, 852-69 ft., 10 bbl. Clark & McKee's No. 1 J. Walterscheid, 779-810 ft., 2 bbl. Joseph Oil Co.'s No. 1 N. Piott, 926 ft., dry and abandoned. Sinclair Prairie Oil Co.'s No. 15 J. M. Best, 4,957-92 ft., 919 bbl. Whitfield, Pearson & Grimes' No. 9 B. Voth, 1,656-65 ft., 100 bbl.

Montague County

United Producers Co. and Continental Oil Co.'s No. 1 W. R. Rich, 3,451-95 ft., 48 bbl.

O. V. Beck's No. 2 J. S. Irvins, 2,741 ft., dry and abandoned. O. V. Beck's No. 3 J. S. Irvins, abandoned location. Perkins & Cullum's No. 11 N. J. Howard, temporarily abandoned location. Rogers & Rogers' No. 2 C. W. Astley, 4,648-94 ft., 496 bbl.

Wichita County

Cable Oil Co.'s No. 33 J. E. Roller, 611 ft., dry. W. F. Houston's No. 11 R. L. Lamz, 260 ft., dry. Bolin & Morganstern's No. 26 W. T. Waggoner, 1,721-44 ft., 20 bbl. C. W. Boller's No. 2 S. Y. Collins and others, 4,592 ft., dry. J. E. Farrell's No. 31 Waggoner D, abandoned location. W. H. Peckham's No. 5 M. A. Love, 1,319 ft., dry. Shell Oil Co., Inc.'s No. 6 N. C. Griffin, 3,710-3,814 ft., 900 bbl. Texas Co.'s No. 2 Fred Tom, 3,774-3,805 ft., 588 bbl. Tide Water and Perkins Cullum's No. 14 W. P. Ferguson, 3,740-3,833 ft., 1,120 bbl. F. E. Van Wormer's No. 3-A J. M. Cochran, 755-58 ft., 60 bbl.

Bridwell Oil Co.'s No. 6 Mrs. Anna Mangold, 3,774-3,825 ft., 896 bbl. Cochran & Cain's No. 1 D. R. Preston, 4,133 ft., dry and abandoned. Consolidated Oil Co.'s No. 11 Julia James, 3,936-4,000 ft., 832 bbl. J. M. Corbett's O. F. Bailey, 543-55 ft., 5 bbl. J. F. Corbett's No. 1 F. C. Dodson, 1,001 ft., dry. E. C. Oil Co.'s No. 19 Mrs. A. Mangold, 3,742-3,815 ft., 680 bbl. Fain-McGaha Oil Corp.'s No. 4-A E. P. Griffin, 3,770-3,846 ft., 1,120 bbl. J. E. Farrell's No. 34-D Waggoner, 3,791-3,850 ft., 1,200 bbl. Grace & Woods and others' No. 7 C. Birk, 3,920-4,048 ft., 1,448 bbl. Granite Oil Trust's No. 7 N. H. Martin, abandoned location. Hammon-Hanlon-Buchanan, Inc.'s No. 8 W. H. Hammon, 3,978-4,062 ft., 1,040 bbl. Hanlon-Buchanan, Inc.'s No. 5-E Fassett & Tuttle, 3,933-4,012 ft., 720 bbl. Hanlon-Buchanan, Inc.'s No. 3-G Fassett & Tuttle, 4,020-75 ft., 640 bbl. Mogren & Anderson's No. 5 Goetze, dry and abandoned at 1,708 ft. Palmer & Chenault's No. 12 S. H. McCarty, 3,826-77 ft., 720 bbl. W. H. Peckham's No. 4 M. A. Love, 3,950-4,082 ft., 920 bbl. D. M. Ross and others' No. 25 Sue Mitchell, 848-59 ft., 3 bbl. Royal Petroleum Corp.'s No. 4 R. B. James, 3,933-4,003 ft., 1,392 bbl. Ryan Consolidated Petroleum Corp.'s No. 131 G. L. Nance, 84 bbl. Jaries S. Smith's No. 5 A. F. Dodson, abandoned location. Southport Petroleum Corp.'s No. 7-A State lands, 3,935-4,039 ft., 504 bbl.

Wilbarger County

Consolidated Oil Co.'s No. 6 W. T. Waggoner CC, 3,798-3,822 ft., 928 bbl. T. B. Medders' No. 6 W. T. Waggoner, 3,056-76 ft., 758 bbl. Pois & Schulz's No. 1 J. Streit and others, 1,230-45 ft., 5 bbl. Pois & Schulz's No. 2 J. Streit and others, 1,873-77 ft., 75 bbl.

Consolidated Oil Co. and Texas Eastern Oil Co.'s No. 3 G. B. Ancell J, 3,755-84 ft., 1,252 bbl. The Falls Refining Co.'s No. 5 J. L. Owens, 3,165-83 ft., 960 bbl. Lido Oil Co.'s No. 19 W. T. Waggoner, 3,962-96 ft., 568 bbl. T. B. Medders' No. 4 W. T. Waggoner, 2,379-2,407 ft., 181 bbl. Voorhies' No. 1-A W. T. Waggoner, junked and abandoned at 675 ft. Waggoner Refining Co.'s No. 1 Waggoner GG, 3,741-50 ft., 400 bbl.

Young County

Caddo Oil Corp. and McLester's No. 1-A J. W. Long, 3,758-3,800 ft., 559 bbl. B. C. Gilmore's No. 1 C. A. Brown, 559 ft., dry. B. C. Gilmore's No. 2 R. L. Watson, 621 ft., dry. Wootten & Wilson's No. 1 W. B. Howard, 977 ft., dry.

Fresno Oil Co.'s No. 26 Prideaux, 728 ft., dry and abandoned. Kriss' No. 2 Jeffery, 905 ft., dry and abandoned. Long's No. 1 G. A. Rills B, 3,901-19 ft., 2,550 bbl. Panhandle Refining Co.'s No. 1 Mrs. E. Taylor, 4,011-36 ft., 424 bbl.

California Fields

(Continued from Page 341)

7,593 ft., and 7,632-72 ft. Standard Oil Co. completed No. 75-13-C in Section 13-20-15, flowing 2,082 bbl. of clean 31.4-gravity oil and 1,497,000 cu. ft. of gas daily from the Gatchell zone at 7,320 ft. Top of the Kreyenhagen was cored at 5,750 ft., Glauconitic at 6,885 ft., and Gatchell oil sand at 6,974 ft. Base of the Gatchell oil sand was found at 7,310 ft. which gives the well 336 ft. of oil sand of high saturation. Liner was perforated at 6,974-7,310 ft.

Cole's Levee

In the Cole's Levee field of Kern County, Richfield Oil Co. completed No. 41-32-A Kern County Land in Section 32-30-25 flowing 1,725 bbl. of 32.3-gravity oil and 1,163,000 cu. ft. of gas from the Stevens zone with bottom of the hole at 9,025 ft. Liner was perforated at 8,623-9,023 ft. No. 20-A Kern County Land of Standard Oil Co. in Section 9-31-25 which was completed last week flowing mostly gas is now producing 1,020 bbl. of 57.2-gravity oil. The 14,000,000 cu. ft. of gas is coming from the upper zone through a 20/64-in. tubing bean and has now been beaned back. The high-gravity crude oil, which is more of a condensate, is coming from the lower zone through a 38/64-in. casing bean. In addition to the oil the lower zone was producing 8,300,000 cu. ft. of gas before the well was cut back in conformity with curtailment. The Stevens zone was cored in this well at 8,380 ft. and base of the oil sand was logged at 9,410 ft.

Greeley

Standard Oil Co., in the Greeley field of Kern County, completed No. 11-20 Kern County Land in Section 18-29-26, doing 4,352 bbl. of 34.9-gravity oil and 2,880,000 cu. ft. of gas from the Rio Bravo or Vedder oil zone at 11,510 ft.

San Joaquin Basin

In the Delano gas field of Kern County Trico Oil & Gas Co.'s No. 2 Tulare Farms in Section 27-24-23 is a commercial gas well, flowing 24,900,000 cu. ft. of dry gas from 2,471 ft. Trico staked location for No. 1 Daniels in Section 22-24-23 but the well will not be spudded in until early in the new year.

In the Edison field of Kern County El Tejon Oil & Refining Co. completed No. 1 Douglas in Section 32-29-29 pumping 132 bbl. of clean 17.6-gravity oil per day from 3,944 ft. after the hole had been carried down to 4,100 ft. and then plugged back.

Coastal District

In the Ventura Avenue field Tide Water Associated Oil Co.'s No. 42 Ventura Land & Water started at 1,490 bbl. of 29.5-gravity oil, cutting 5 per cent, and 1,390,000 cu. ft. of gas per day, from the 57 zone at 9,810 ft. The 5½-in. liner was perforated at 9,150-9,807 ft.

Los Angeles Basin

Richfield Oil Corp. completed a small well in the Long Beach field of Los Angeles Basin this week when No. 8-B Municipal was finished pumping 98 bbl. of 22.1-gravity, oil cutting 20 per cent, from 4,940 ft. Liner was perforated at 4,146-4,519 ft., 4,590-4,747 ft., and 4,774-4,930 ft. Dormax Oil Co. failed to secure a natural flow in No. 1 Signal bottomed in the deep zone at 10,394 ft. and was obliged to put it on a compressor. The well is producing 120 bbl. of 29.2-gravity oil daily. The cut has been varying from 12 to 50 per cent and by a strange condition for several days the zone has been taking part of the gas injected.

Fourth Welding Conference To Be Held at Lubbock

The fourth biennial Welding Conference on Electric and Oxyacetylene Welding will be held at the Texas Technological College, Lubbock, Tex., February 2-3.

Texas and Louisiana Gulf

By NEIL WILLIAMS

Prospective Pool in Iberia Parish; Extend Anchor Pool

HOUSTON, Tex., Dec. 26.—A new oil field in the Louisiana part of the Gulf Coast district was indicated, as Plymouth Oil Co.'s No. 1 McHugh, in the Bayou Pigeon area, Iberia Parish, recovered pipe-line oil on a drill-stem test. Sand showing oil was topped at 7,277 ft., and the section was cored to a depth of 7,285 ft., where a 10-minute drill-stem test recovered approximately 17 bbl. of oil. Flowing bottom-hole pressure was 3,250 lb. At the close of the week the company was coring ahead below 7,616 ft. in search of a deeper sand. The well is in Section 13-12s-10e, north of the Charenton field, and several miles southwest of the Fausse Point field. The area was worked with geophysical instruments by Shell Oil Co., Inc., which farmed out the block to Plymouth Oil Co.

An active deep-drilling program is getting under way in the newly opened Barataria field, Jefferson Parish, as drilling was scheduled to be started on four wells. The latest location was made by Vendome Oil Co., which has applied for a War Department permit to dredge a canal to a point in the southeast quarter of Township 15s-25e. Other locations include Carter, Perrin and others' No. 1 Rettley Wiseman, in Section 2-16s-23e; George B. Conover's No. 1 Conover Community, Section 29-15s-23e, and Fohs Oil Co.'s No. 1 E. M. Conzelman, Section 22-15s-23e. The discovery well, California Co.'s No. 1 Adams Rutley was completed last month in sand at 8,204-14 ft.

In Vermilion Parish, on the Erath prospect, Texas Co.'s No. 1 Vermilion Parish School Board, Section 16-13s-4e, is bottomed at 9,923 ft., and a protection string of 7⅝-in. casing was cemented at 9,918 ft. An electrical survey was run to the bottom of the hole and is reported to have recorded no showings.

Shell Oil Co., Inc., abandoned another deep test in the South Houma field, Terrebonne Parish. It was No. 4 Peters, Section 72-18s-18e, total depth of 11,344 ft.

Texas Coast

Along the Texas Coast Humble Oil & Refining Co.'s No. 1 M. W. Mettler, Anchor field, Brazoria County, was cleaning out, flowing wash water and high-gravity oil to mark up a 1-mile northeast extension. The well was drilled to 10,617 ft., and is testing through perforated casing at 10,578-85 ft. The producing horizon is slightly deeper than that in the discovery well which was completed in a 10,400-ft. sand. Approximately 2,000 ft. northwest of the discovery well Glenn McCarthy was retesting No. 1 Salmon & Momma after a production test through perforated casing at 10,518-25 ft. recovered salt water. The original perforations were squeezed off and the well is testing through perforations at 10,491-10,501 ft. Humble Oil & Refining Co. has derrick up for No. 1 R. H. Carr, Block 62, about 2,000 ft. southeast of the discovery well.

In the same county and located in the Juliff area John Mayo and others' No. 1 Darrington State Prison farm is drilling in shale below 8,562 ft. The well is reported to have topped the Vicksburg formation, although no showings of oil or gas have been reported. The well is in the McFarland League, about 2,000 ft. southwest of Hamman Exploration Co.'s No. 1 Darrington State Prison farm, an abandoned well, which recorded several interesting showings in the Vicksburg formation. In the same area, but in Fort Bend County, Gulf Oil Corp.'s No. 1 Russell Brown is bottomed at 8,380 ft., and the hole is expected to be cored deeper. Protection casing was recently cemented after the well attempted to blow out from high-pressure gas sands.

Preparations were made to test Magnolia Petroleum Co.'s No. 1 R. G. Huntington, a prospective pool opener, approximately 2½ miles northwest of Rosenberg, Fort Bend County. The hole is bottomed at 8,698 ft., and approximately 195 ft. of liner is being run to test a sand and sandy-shale section at 8,658-86 ft., which was logged as showing gas and distillate. An electrical survey is reported to have shown several "kicks" below 8,200 ft., and a protection string of 7⅝-in. casing was recently cemented at 8,552 ft., after the well attempted to blow out.

Production from the 5,700-ft. sand recently opened on the extreme northwest side of the West Ranch field, Jackson County, is believed to have been extended approximately 2½ miles southeast as George Greer and others cemented casing on bottom at 5,767 ft. in No. 2 Ward, after an 8-minute drill-stem test at 5,722-52 ft., tested 75 lb. working pressure, 360 ft. of oily mud, 2,610 ft. of pipe-line oil and 180 ft. of salt water. This well is an offset to the same operators' No. 1 Ward, the most easterly well on the structure which was completed as an average producer in the 5,500-ft. sand. No. 2 Ward cored broken sand and shale showing oil and gas at 5,544-53 ft. and 5,574-84 ft., but the hole was deepened to the 5,700-ft. sand, following the completion of the Lonnie Glasscock's No. 10 Drummond, the previous week, in the 5,700-ft. sand.

Location for a wildcat was made in Jackson County by Wheelock & Collins for No. 1 Four Way ranch, 466 ft. from the north line and 466 ft. from the east line, Block 57, of the second subdivision of La Ward farm in the Young and Coleman Survey.

In the Garwood area, Colorado County, W. R. Davis & Co.'s No. 1 McLane is coring in sandy shale at 9,972 ft. Sand and shale, showing gas and distillate, were logged at intervals from 9,789-9,972 ft. A protection string of 7⅝-in. casing was recently cemented at 9,780 ft. Broken sections of sand and shale showing gas and distillate have been logged at intervals in the Tertiary Wilcox formation at intervals from 9,400 ft. to the present depth.

Location for another wildcat was made in Galveston Bay, Galveston County, by Standard Oil Co. of Texas and others. The well is 440 ft. from the northwest and southwest lines of Section 234. The company is driving piling foundations. Hebert and Smith's No. 1 John Harris, a wildcat located on Galveston Island, was abandoned at a total depth of 6,704 ft.

In Montgomery County approximately 3½ miles southeast of the Conroe field, Cameron Petroleum Co staked location for No. 1 Youens, a Cockfield test in the D. W. Collins Survey. Reports that David B. MacDannald's No. 1 H. O. Baldwin had logged gas showings in the Tertiary Wilcox formation could not be confirmed. The well is being drilled as a "mystery." The hole is reported to be below 8,900 ft.

In the Clam Lake field, Jefferson County, Shell Oil Co., Inc., was attempting to complete No. 8 McFaddin estate. The hole is bottomed at 6,040 ft., and casing cemented to test a sand and shale section at 5,815-5,950 ft. Should the well make a producer from this horizon it will be the second oil well from this sand. Recent completions have been from the Miocene sand at 3,900-4,200 ft.

TEXAS GULF COAST COMPLETIONS IN PROVEN FIELDS

Brazoria County

Hastings field: Stanolind Oil & Gas Co.'s No. 7 Ware, sand 6,100-10 ft., 458 bbl., ¼-in. choke. Stanolind Oil & Gas Co.'s No. 37-C Curkett, 6,095 ft., 399 bbl., ¼-in. choke. Stanolind Oil & Gas Co.'s No. 19 Sneed, perforated casing 6,036-78 ft., 630 bbl., ¼-in. choke. Stanolind Oil & Gas Co.'s No. 20 Sneed, perforated casing 5,983-6,0[illegible] ft., 465 bbl., ¼-in. choke. West Columbia field: Texas Co.'s No. 34 Abrams, 5,442 ft., 220 bbl., various chokes.

Chambers County

Anahuac field: Gulf Oil Corp.'s No. 2-C Blanke, sand 7,115-40 ft., 565 bbl., ¼-in. choke. Humble Oil & Refining Co.'s No. 30 Tyrell, 7,080 ft., 672 bbl., ¼-in. choke. Cotton Lake field: Humble Oil & Refining Co.'s No. 2-D Lawrence, sand 6,511-17 ft., 129 bbl., ⅛-in. choke.

Hardin County

Batson field: B. G. Dowell's No. 119 Buchanan, sand 1,022-53 ft., 10 bbl., pumping. Silsbee field: Republic Production Co.'s No. 30 fee, sand 6,931-43 ft., 390 bbl., ¼-in. choke.

Harris County

Clear Lake field: Humble Oil & Refining Co.'s No. 26-C Humble-West, 5,912 ft., 120 bbl., ⅛-in. choke. Friendswood field: Humble Oil & Refining Co.'s No. 17 Kiesling-Dixon, sand 6,031-45 ft., 568 bbl., ¼-in. choke. Humble field: Texas Co.'s No. 34 C. O. & G. Co., 2,929 ft., 145 bbl., ¼-in. choke. Tomball field: Texas Co.'s No. 5 Doughtie, sand 5,520-55 ft., 109 bbl., ⅛-in. choke.

Jackson County

Cordele field: Magnolia Petroleum Co.'s No. 1 Yaussi, 2,665 ft., dry and abandoned. West Ranch field: Lonnie Glasscock's No. 10 Drummond, sand 5,772-79 ft., 701 bbl., ¼-in. choke. Magnolia Petroleum Co.'s No. 35-A West ranch, sand 5,120-31 ft., 165 bbl., ¼-in. choke.

Jefferson County

Lovells Lake field: Humble Oil & Refining Co.'s No. 8 Jefferson Land Co., sand 7,765-78 ft., 159 bbl., ⅛-in. choke. Stanolind Oil & Gas Co.'s No. 5-A Steinhagen, perforated casing 7,779-94 ft., 190 bbl., ⅛-in. choke.

Liberty County

Hardin field: R. Y. Smith's No. 1 Cochran, perforated casing 7,612-19 ft., 118 bbl., ⅛-in. choke.

Matagorda County

Citrus Grove field: McDannald Oil Co.'s No. 1 Shell, perforated casing 4,090-4,100 ft., gas well.

Polk County

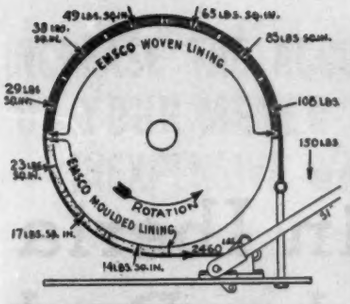
Segno field: Gulf Oil Corp.'s No. 25 Wing, 8,110 ft., 368 bbl., ¼-in. choke.

Wharton County

Magnet field: Humble Oil & Refining Co.'s No. 21 H. C. Cockburn, 5,543 ft., 100 bbl., ⅛-in. choke. Texas Co.'s No. 41 Pierce, sand 5,543-52 ft., 48 bbl., ⅛-in. choke. Texas Co.'s No. 66-C Pierce, sand 5,538-44 ft., 50 bbl., ⅛-in. choke.

New Woodbine Gas-Recycling Plant for Cayuga Field

FORT WORTH, Tex.—Construction of a third plant for recycling gas from the Woodbine plant in the Cayuga field of Anderson and Henderson counties, eastern Texas, will get under way soon after the first of the year. Roeser & Pendleton, Inc., will build the plant which will be of the refrigeration type, of 10,000,000 cu. ft. daily capacity, and will be constructed by Stearns-Roger Manufacturing Co. of Denver, Colo. Roeser & Pendleton have two plants for recycling gas from the Trinity pay to the shallower Woodbine, but this will be its first unit for recycling Woodbine gas. Tide Water Associated Oil Co. and Seaboard Oil Co. operate two plants for recycling Woodbine gas, one placed in operation earlier this year.



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Among the Drilling

NOWLIN & WILLIAMS, Dallas, Tex., are the drilling contractors at a new wildcat test in Freestone County, eastern Texas. It is A. G. W. Biddle's (Fort Worth) No. 1 Nettles, Dollahite Survey, 6 miles northwest of Fairfield. The test was last reported bottomed at 3,450 ft. and preparing to core from the Woodbine sand. The operator has a block of 2,500 acres surrounding the test.

J. H. EDWARDS, San Angelo, Tex., will be the driller in charge of two shallow semiwildcat tests to be drilled in the old Baker area of Coleman County, West Central Texas. O. L. Kilpatrick and Pinkney B. Wilson, both of San Angelo, are the operators and the tests will be on a 320-acre tract leased from G. R. McClure. A spudder belonging to William W. Gruber of San Angelo will be used. The contract provides the drilling of a second test regardless of the outcome of the first one. The No. 1 McClure will be 500 ft. from the north and 150 ft. from the west lines of the SE¼ Section 105, E.T. R.R. Co. Survey.

LEE DRILLING CO., Tulsa, has been awarded contract for a new test in the South Lovington pool of Lea County, New Mexico. The test will be for Skelly Oil Co. as its No. 2-N State and will offset to the east the company's No. 1-N State, discovery oil well for the pool. Location is 600 ft. from the north and east lines of Section 36-16s-36e.

ADAMS DRILLING CO., eastern Texas contracting firm, is due to start operations soon at a new test in the Flag Lake pool of northwestern Henderson County, eastern Texas. Stimulated by the discovery of oil several months ago by Topaz Oil Co. across the Trinity River and in northern Navarro County, S. N. Rowan, operator of Athens, is preparing to drill two and perhaps three tests between the Flag Lake pool and the Navarro County extension area. The operator has acquired a 20-acre lease on the Trinity River bed between the two areas and plans immediate development of the tract.

McCUTCHIN DRILLING & Producing Co., Tyler, Tex. (Alex McCutchin), is reported to have signed contract with Beacon Refining Co. for an 8,000-ft. wildcat test northwest of Henderson in Rusk County, eastern Texas. Tentative location has been made in the McWilliams tract in the J. G. De La Vina Survey. Beacon Refining Co. has been reported leasing in the general area for several weeks. The contract depth will carry the hole into the lower Trinity sections which have recently received considerable attention throughout the eastern Texas district.

W. B. OMOHUNDRO, contractor and producer of Wichita Falls, Tex., has received the contract for a second test to the recently opened 4,300-ft. pay level in the Rogers & Rogers pool of Montague County, North Texas. It will be Youngblood & Foree's No. 1 Hillcrest addition, the location being on a 20-acre community owned tract on the west edge of the Nocona townsite. The test is a 1,500-ft. southeast outpost to the same operator's No. 1 Davis which recently opened the 4,300-ft. pay section for the pool. Location for the new test is 466 ft. north of the highway and 330 ft. east of the west line of the tract, J. D. Jennings Survey.

MURRAY & GRIFFEY DRILLING Co., Tulsa, and R. L. Kemp, Cushing, Okla., are preparing to drill No. 1 Anna Masquat in NE SE NW Section 26-17n-6e, Lincoln County, Oklahoma. This location is in the Shamrock sector of the Cushing field. The intention is to test Layton and Prue sands in the course of drilling to the Wilcox.

SPRINGROSE DRILLING CO. of Wichita, Kans., and others are drilling a wildcat at No. 1 Joe Swanson, NW NW Section 18-20-5w, north of production in the Bornholdt pool, McPherson County, Kansas. The chat was topped at 3,304 ft.; at a depth of 3,319 ft. bottom-hole cuttings showed oil saturation.

SUMMIT DRILLING CO., Paul McIntyre, and associates opened a new Booch-sand pool near Weleetka in Okfuskee County, Oklahoma, by drilling No. 2-A Steil, in SW¼ Section 18-10-11e. The well came in making 12 bbl. an hour through tubing. Another well is to be started at the No. 1 Thompson, in SE cor. SW NW Section 18. The No. 1-A Steil, twin to the No. 2-A Steil, failed to get oil production but was completed for a gasser.

A. O. OLSON of Shreveport, La., completed the lower Marine discovery well, Lisbon Exploration Co.'s No. 1 Vaughn in the Lisbon field, Claiborne Parish, Louisiana, last week for a gas-condensate well. This well, supported financially by independents, majors and individuals interested in Lisbon, may have a far-

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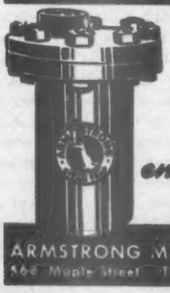

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Contractors

reaching effect on future production practices in the Pettit-lime zone of the field.

GLENN H. McCARTHY is completing his No. 1 Salmon and Momma located in the Anchor field, Brazoria County, Texas. The hole is bottomed at 10,510 ft., and production test is being made through perforated casing at 10,491-10,501 ft. In the Chocolate Bayou field, Brazoria County, No. 2 Houston Farm Development Co. is coring for the pay below 10,000 ft.

N. W. HUNTER cemented surface casing on No. 1 Rehmann, a flank test located on the San Felipe dome, Waller County, Texas. The well is being drilled jointly with John Mayo. Another rotary is being moved to Fort Bend County for Bashara and others' No. 1 Sugarland Industries, a projected deep test located on the northwest flank of the Sugarland field.

GEORGE ECHOLS abandoned Hebert & Smith's No. 1 Harris at 6,704 ft. The well is located on Galveston Island in Galveston County, Texas. In the South China field, Jefferson County, No. 1 John M. Guiterman, being drilled for Hebert & Smith, is drilling in shale and lime below 7,200 ft.

MARTIN THOMPSON is drilling below 4,200 ft. in No. 1 Alexander Sharp, a wildcat located in the Almeda area, Harris County, Texas. This well is being drilled jointly with John Mayo and is scheduled to be drilled to the Frio formation. In Chambers County, George Anderson's No. 1 Lawrence, 3 miles northeast of the Cedar Creek field, is being spudded.

JACK FRAZIER is coring for the pay on No. 1 Darrington State Prison Farm, a wildcat located in the Juliff area, Brazoria County, Texas. The well is being drilled jointly with John Mayo. Contract was received for Ray N. Ranger's No. 1 Sugarland Industries, a projected deep test located about 5 miles northwest of Rosenberg in Fort Bend County.

McDANNALD OIL CO.'S No. 1 G. W. Shell, located on the Citrus Grove prospect, Matagorda County, Texas, was completed for a dry gas well. The well was drilled to a total depth of 5,803 ft., and was completed through perforated casing at 4,090-4,100 ft.

TRINITY DRILLERS, INC., marked up a 2,000-ft. southeast extension to the Victoria field, Victoria County, Texas, as the company's No. 1 Molar tested 1,140 ft. of pipe-line oil on a 15-minute drill-stem test at 2,554-56 ft. Five and one-half inch casing was cemented on bottom at 2,558 ft.

RYAN & ANDERSON of Jackson, Miss., are drilling below 2,100 ft. in Wilmut Gas & Oil Co.'s No. 1 Roberts, a Munroe County wildcat near the Amory gas field in northeastern Mississippi. They are also drilling the Charles W. Crader's No. 1 D. D. Wells, a Sharkey County wildcat located on a 12,000-acre block in the Egermont district.

Crew on an R-G Drilling Co. rig, Wichita Falls, Tex., drilling in the Hull-Silk field of northern Archer County, North Texas

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Eastern Field Report

By STAFF CORRESPONDENT

Big Gas Producers in West Virginia's Oriskany Fields

PITTSBURGH, Pa., Dec. 26.—On Chestnut Ridge in Fayette County, Pennsylvania, New Penn Development Co., William E. Snee and others are drilling at 6,724 ft. on the Piedmont Coal Co. land in North Union Township. After running casing to 6,692 ft., the corrected measurement for the top of the Onondaga is 6,663 ft. and the top of the cherty zone 6,692 ft.

SOUTHEAST OHIO

In Athens County, Southeast Ohio, Gross & McCune completed No. 5 Grant Antle in Section 30, Rome Township, in first Cow Run sand at 471 ft. and it is good for 5 bbl. a day after shot. Gibson Oil & Gas Co. completed Nos. 7 and 8 on the Willis and Vinne Vandyke farm in the same formation at 480 and 410 ft., respectively, and after shot they are showing for 3 and 5 bbl. a day.

In Cuyahoga County Benedum & Trees completed No. 1 Dawson in Mayfield Heights village at 2,920 ft. and it gaged 381,000 cu. ft. a day.

In Medina County Marine Trust Co. completed five wells in its water-flooding program all of which will be used as input wells.

In Lorain County W. M. Dempsey completed a 5-bbl. well on the Emery Howath farm, Tract 6, Lot 41, Penfield Township, in Clinton sand at 2,545 ft. In Lot 43 this operator completed Nos. 1 and 2 True Dunham in Berea grit at 261 and 242 ft., respectively. No. 1 is good for 2 bbl. a day with 50,000 cu. ft. of gas and No. 1 for 5 bbl. a day and 20,000 cu. ft. of gas.

In Perry County Preston Oil Co. completed No. 2 William Griffith in Section 17, Clayton Township, in Clinton sand at 3,243 ft. It gaged 500,000 cu. ft. a day with a small showing of oil.

SOUTHWEST PENNSYLVANIA

In Allegheny County, Southwest Pennsylvania, Homer Nixon completed a well on the Joseph Hickman farm in South Fayette Township in Fifth sand topped at 2,580 ft., and had a showing of 36,000 cu. ft. a day with the bottom of the sand at 2,607 ft.

Armstrong County

In Cowanshannock Township, Armstrong County, the T. W. Phillips Gas & Oil Co. completed a gas well on the H. H. Harkleroad farm at 3,426 ft., Bradford sand, and it gaged 1,900,000 cu. ft. a day.

In Boggs Township John Wray and others drilled a dry hole on the Warren Mateer farm through the Murraysville sand to 1,320 ft. and it was dry. William Mateer has started drilling on the Samuel Yockey farm.

In South Bend Township Shelocta Oil & Gas Co. has completed a new gas well on the Harve Reefer farm at 3,675 ft., Speechley and Tiona sands, good for 82,000 cu. ft. a day.

Indiana-Clarion-Westmoreland

In Washington Township, Indiana County, T. W. Phillips Gas & Oil Co. finished a gas well on the B. S. Conner farm at 3,119 ft., Bradford sand, and it gaged 650,000 cu. ft. a day. In White Township the company completed the test on the F. B. Loman farm at 3,281 ft.

Deep Tests

On Laurel Ridge in Fayette County New Penn Development Co., William E. Snee, and E. G. Mueller are drilling at 2,413 ft. on the Gregg L. Neel farm in Stewart Township. In Maryland the New Penn Development Co. with William E. Snee is drilling at 5,054 ft. in the Humberson test on the Accident dome in Garrett County.

On Chestnut Ridge in North Union Township, Fayette County, Wasson & Co. have reached 2,300 ft. in No. 2 J. H. Sorg. A lot of water is being carried which will soon be cased off.

WEST VIRGINIA

Several oil wells were completed in West Virginia during the week. In Pleasants County the Columbian Carbon Co. plugged back the test on the Ervin-Hammett farms in Grant district from 5,311 ft. to 2,930 ft. and it will produce about 3 bbl. a day with 3,000 cu. ft. of gas from the Speechley sand. This test had been drilled through the Oriskany sand which was void of any showing.

In McKim district, Pleasants County, Earl M. Henning completed the test on the Mary Jane Mercer farm at 1,830 ft. in Injun and Maxton sands, and it is showing for 3 bbl. a day and 100,000 cu. ft. of gas.

In Roane County O. H. Reed and others completed No. 3 P. V. Litton in Harper district at 1,685 ft., Salt sand, and it is making 30 bbl. a day. Bonnett Oil & Gas Co. completed a gas well on the J. M. Jones farm at 1,668 ft., Salt sand, and it is gaging 500,000 cu. ft. a day.

In Curtis district, Roane County, Harper Oil Co. and others completed the test on the G. M. Eagle farm at 1,609 ft., Salt sand, and it is pumping 10 bbl. a day. Here, Reedy Oil & Gas Co., on the Llewellyn heirs' farm drilled through the Salt sand, to 1,630 ft. and the well makes only about 5 gal. of oil a day and may not be produced.

In Tyler County Tyler Wood Oil Co. has rigged up a pump for No. 1 D. E. Davis in Centerville district, which had been a gas well, and it is now making 2½ bbl. of oil a day, along with 100,000 cu. ft. of gas, from Big Injun sand at 1,750 ft.

Gas Wells

In Boone County the Hope Natural Gas Co. completed No. 7911 Dora E. Hopkins in Washington district at 2,405 ft. It gaged 4,135,000 cu. ft. a day 48 hours after the shot.

In Clay County Thompson Gas Co. completed No. 38-T Matthew, Scott and Price, in Henry district, at 2,106 ft., in Big Injun sand, with a gage of 35,000 cu. ft. a day, after a bomb shot.

In Gilmer County F. G. Bish completed a second test on the B. S. Messenger farm in Troy district at 1,942 ft., in Injun sand at 1,840-1,937 ft., and 50,000 cu. ft. of gas before the shot.

In Lincoln County United Fuel Gas Co. deepened No. 2371 Huntington Development & Gas Co., starting at 2,029 ft. Brown shale lay at 2,665-3,290 ft. and the well produced 300,000 cu. ft. of gas after a shot at 2,882-3,050 ft.

Oriskany Gas Field

In Poca district, Kanawha County, the United Carbon Co. completed a fair well in the test on the E. P. Higginbotham and others farm. It was bottomed at 5,190 ft. with the Corniferous lime at 5,067-5,163 ft.; Oriskany 5,163 ft. and a final gage of 14,935,000 cu. ft. a day. This company is drilling at 1,375 ft. in the W. J. Bumgardner and others No. 815, and rigging up the No. 816 Louisa E. Long.

Outside Deep Tests

In the extension of the Elk-Poca field of Kanawha County into Jackson County, the United Carbon Co. completed the largest well up to the present date. On the W. W. Riley and others' lease this company topped the Corniferous lime at 4,966 ft.; Oriskany 5,082 ft.; gas 5,085-5,106 ft., and the well gaged 18,000,000 cu. ft. a day with a rock pressure of 1,830 lb. It is in the Washington district. United Fuel Gas Co. is completing No. 4860 Monroe Jones and others, with the Oriskany sand at 5,109-39 ft. It gaged 3,761,000 cu. ft. a day while cleaning out after the shot.

Benedum-Trees Will Test Deep Horizons in McKean County

BRADFORD, Pa., Dec. 26.—Oil-field interest turns to a section in the northwestern part of McKean County where 30,000 acres have been leased for drilling of deep wildcat wells.

Contract for wells to be drilled into the Oriskany sand at a depth of about 4,400 ft. has been let to Fulmer D. Hill of Kane, Pa., who expects to begin spudding the first well this week. The wells are being drilled for the Hiawatha Oil & Gas Co., a subsidiary of Benedum-Trees, Inc., of Pittsburgh.

The first well is located about 10 miles southwest of Bradford. The huge acreage extends through into New York State. The initial well is being drilled on Lot 3705.

There is no Oriskany well within 3 miles of the site of the new wildcat. The closest deep well had a production of 3,000,000 cu. ft. of gas before salt water killed it, according to reports of oil-field men.

Ohio Fields

(Continued from Page 338)

others' No. 1 Guernsey County Infirmary, Section 25, is a 6-bbl. settled producer in the Macksburg 500-ft. sand at 470 ft.

Licking County, in the Newark area, had three gas wells and two dry holes were completed, in the Clinton sand. Madison Township, Dawler Oil & Gas Co.'s No. 1 F. Deuselback, Lot 3, second quarter, is good for 500,000 cu. ft. of gas, open flow, sand at 2,614-49 ft. Bebout & Co.'s No. 1 L. Flurshultz, Lot 5, second quarter, gaged 370,000 cu. ft., open flow, sand at 2,594-2,696 ft. Newton Township C. O. Moore and others' No. 1 H. B. Hughes, trustee, northeast part of first quarter, open flow of 790,000 cu. ft. of gas, sand at 2,533-55 ft. J. L. Hunt's No. 1 Archie Nethers, west part of first quarter, found the Clinton dry at 2,670 ft. Mary Ann Township More & Murphy's No. 1 John A. Miller, Section 24, dry at 2,895 ft. Fallsbury Township W. H. Larrick's No. 1 William Frampton, Section 8, made 28 bbl. of oil in the first 24 hours after a shot in Clinton sand at 2,938-79 ft.

Lorain County, Penfield Township, William Dempsey and others' No. 2 Thomas Szues, Lot 45, gaged 1,500,000 cu. ft. of gas, open flow, from Clinton at 2,529-45 ft.

Meigs County, Rutland Township, B. & U. Gas Co.'s No. 1 G. E. Might, Section 25, was dry in the Salt sand at 715 ft.

Noble County, Beaver Township, Yoker Valley Oil & Gas Co., Section 33, has an open flow of 1,600,000 cu. ft. from the Berea at 1,408 ft. Seneca Township, T. L. Rich's No. 1 Hark Williams, Section 29, is good for 70,000 cu. ft., open flow, from Berea at 1,523 ft. Wayne Township, Eugene Ward on fee property, Section 2, bailed 40 bbl. of oil the first 24 hours from 686-90 ft., some water is showing.

Stark County, Lawrence Township, Dun-Mar Oil & Gas Co.'s No. 1 J. H. Gill, Section 11, gaged 1,250,000 cu. ft. of gas from Clinton sand at 4,016-41 ft.

Tuscarawas County, Dover Township, Brendel Producing Co.'s No. 1 George B. Yackey, Lot 20, second quarter, made 2,200,000 cu. ft. of gas, open flow, in the Clinton sand at 4,477-4,513 ft.

Washington County, Grandview Township, H. E. Dixon and others' No. 1 W. A. Whittington, Section 26, had a show of oil in the Squaw sand, but a shot failed to improve it; abandoned at 1,726 ft.

Kansas Developments

By
DAL DALRYMPLE

Gas Well in Cairo Sector, Cunningham, Produces Oil

Discovery of oil in the Cairo sector of the Cunningham field in Pratt County was a feature of field operations in Kansas during Christmas week. Skelly Oil Co.'s No. 1 Harding, C SW¼ Section 7-28-11w, originally was completed as a gas well in Viola lime at 4,283 ft., total depth. It was shut in and when reopened recently began producing oil. After acid treatment it made daily potential of 374 bbl. of oil, with 2,500,000 cu. ft. of gas. The location is about 5 miles southwest of Cunningham oil production on both sides of the Kingman-Pratt county line.

Arbuckle production in the Hoisington area, Barton County, was extended ¼ mile northeastward at W. C. McBride, Inc.'s No. 1 Soderstrom, SE NW NE Section 21-17-13w. It found Arbuckle lime at 3,476 ft., set 7-in. casing at 3,477 ft. and was bottomed at 3,491 ft. When plug was drilled, 37-gravity oil rose 1,000 ft. in the hole. The crew was preparing for completion test.

A new producing area in Stafford County apparently was assured at Shell Oil Co.'s No. 1 Smith, SE SE NW Section 9-21-11w, 1 mile north of the South Snider pool and southwest of the Snider pool. It had Arbuckle lime at 3,403 ft. and found some saturation in cores to 3,415 ft. A string of 4½-in. casing was to be run.

Work was started at the first wildcat to be drilled in Gove County in 2 years at Cities Service Oil Co.'s No. 1 Victory, CWL NW¼ Section 36-13-30w. Rotary rig was being erected. Location is about 38 miles northwest of the Aldrich area, Ness County.

In far northwestern Kansas, George A. Dye staked location for No. 1 Howland, SE cor. Section 32-2s-32w, Rawlins County. It is about 12 miles south of the Nebraska line and is some 76 miles northwest of the Wakeeney pool in Trego County. Neatest production, however, is in Power Oil Co.'s one-well pool in Norton County, about 70 miles east and slightly south.

Estimated Daily Production

Estimated daily production for Kansas for the week ended December 23, and for the preceding week was as follows:

	Barrels	
	Dec. 23	Dec. 16
Oxford City	800	850
Burrton	10,250	10,750
Ritz-Canton	4,250	4,550
Graber	3,300	2,800
Hollow-Nikkel	1,950	2,150
Lerado	1,100	1,050
Voshell	1,700	1,800
Wellington	2,950	2,250
Ellsworth County:		
Lorraine	1,850	1,750
Other pools	2,260	2,005
Rice-Barton counties:		
Bloomer	5,200	4,000
Chase	5,100	4,850
Geneseo	3,850	3,700
Raymond	600	600
Silica	12,350	12,200
South Silica	3,150	2,000
Keesling	1,150	1,250
Wherry	3,900	3,950
Miscellaneous Rice	5,085	4,870
Miscellaneous Barton	9,855	10,400
Russell County	28,055	27,560
Sedgwick County	3,350	3,500
Ellis County:		
Bemis	6,150	6,250
Miscellaneous	6,135	5,560
Kingman County	1,000	795
Stafford County	7,735	9,495
Greenwood County	8,550	8,600
El Dorado	7,700	7,750
Other fields	35,325	35,165
Total Kansas	183,750	182,450

Ellis County

Dickey Oil & Gas Co.'s No. 2 Stein, S½ NW SE Section 7-11-17w, South Burnett pool, Ellis County, was completed for maximum potential of 3,000 bbl. of oil after acid treatment. It drilled Arbuckle lime at 3,400-19 ft., total depth, and oil rose 2,700 ft. in the hole in 45 minutes.

Earl Wakefield's No. 2-A Burnett, SW NE SE Section 1-11-18w, was acidized and completed in Arbuckle lime for maximum allowable potential of 3,000 bbl. of oil.

Lario Oil & Gas Co.'s No. 4-C Cress, C S½ S½ SW Section 13-11-17w, Bemis field, had Arbuckle lime at 3,373-83 ft., total depth, pumped 57 bbl. of oil in 3 hours, and was completed for maximum potential of 3,000 bbl. of oil daily.

Shell Oil Co., Inc.'s No. 29 Rumsey, NE SE NE Section 23-11-17w, swabbed 275 bbl. of oil in 4 hours and made daily allowable potential of 3,000 bbl. Production was from Arbuckle lime at 3,413-23 ft., total depth.

Gulf Oil Corp.'s No. 1 Denman, N½ SE SW Section 11-12-18w, Walter area, found Arbuckle lime at 3,670-80 ft., total depth, pumped 283 bbl. of oil in 10 hours and made daily potential of 2,790 bbl. of oil, with 210 bbl. of water.

Russell County

Coralena Oil Co.'s No. 7 Sellens, E½ NE SW Section 20-15-13w, Trapp field, Russell County, penetrated Arbuckle lime at 3,317-21 ft., total depth, was treated with 4,000 gal. of acid, pumped 781 bbl. of oil in 8 hours and made 24-hour potential of 2,343 bbl.

Skelly Oil Co.'s No. 5 Rein, N½ NW SE Section 8-15-13w, Coralena pool, found Arbuckle lime at 3,227-44 ft., total depth, pumped 167 bbl. of oil in 5 hours, and was completed for daily potential of 504 bbl.

Same company's No. 6 Rein, S½ NE SE Section 8-15-13w, had Lansing lime at 3,023-64 ft., total depth, flowed 685 bbl. of oil in 8 hours and made 24-hour potential of 2,054 bbl. Gas gaged 3,892,000 cu. ft.

Cities Service Oil Co.'s No. 1 Rogg C, S½ SW SW Section 21-14-13w, Letsch area, was bottomed at 3,265 ft., acidized without result and was dry and abandoned.

Earl Wakefield's No. 1 Schmidtberger, N½ NE SW Section 17-13-15, new Russell County wildcat, was moving in material.

Barton County

Stanolind Oil & Gas Co.'s No. 21 Panning, S½ NW SE Section 10-20-11w, South Silica field, Barton County, swabbed 24 bbl. of oil an hour from Arbuckle lime at 3,281-91 ft., total depth, and was completed for depthograph potential of 2,875 bbl. of oil.

Same company's No. 5 Jutting, N½ NW NE Section 15-20-11w, had Arbuckle lime at 3,302-08 ft., total depth, swabbed 18 bbl. of oil an hour and made potential of 583 bbl.

Shell Oil Co., Inc.'s No. 1 Oeser, SW SW NW Section 17-16-11w, Prusa pool, pumped 279 bbl. of oil in 8 hours from Arbuckle lime found at 3,311-25 ft., and made maximum-allowable potential of 3,000 bbl. of oil.

Rice County

Finston & Co.'s No. 2 Hathaway, S½ NW SW Section 27-19-10w, Silica field, Rice County, found Arbuckle lime at 3,283-86 ft. and 3,296-98 ft., total depth, pumped 270 bbl. of oil in 8 hours and made daily potential of 810 bbl.

Central Petroleum Co.'s No. 1 Roelfs, C N½ NW NE Section 27-19-10w, pumped 28 bbl. of oil in 8 hours from Arbuckle lime at 3,280-86 ft., total depth, and made 24-hour potential of 84 bbl.

Stanolind Oil & Gas Co.'s No. 6 Manke, N½ NW SE Section 28-19-10w, drilled quartzite at 3,200-43 ft., total depth, and produced 5,000,000 cu. ft. of gas daily.

C. L. Carlock's No. 2 Culbertson, C E½ SE SE Section 22-21-7w, Wherry area, was dry and abandoned at 3,404 ft., total depth.

Cowley County

Arthur Brewer's No. 6 Lewis, SW SE NE Section 28-31-4, Hittle field, Cowley County, found Arbuckle lime at 3,362-66 ft., was bottomed at 3,367 ft., made depthograph potential of 5,064 bbl. of oil and was completed for maximum-allowable potential of 3,000 bbl.

Mitchell Drilling Co.'s No. 1 Ireton, SE SE NE Section 7-31-4, wildcat in Cowley County, based Mississippi lime at 3,218 ft., topped Arbuckle lime at 3,298 ft., and was dry and abandoned at 3,304 ft., total depth.

Earl Wakefield's No. 1 Steel, E½ SW SE Section 6-32-6, wildcat, found water sand at 3,060 ft., and was abandoned at 3,114 ft., total depth.

Crown Petroleum Co.'s No. 1 Dunn, NW NW SE Section 19-34-6, was location for a new Cowley County wildcat.

Marion County

Lariaux and others' No. 2 Forsberg, SW SE SW Section 21-17-4, Lost Springs pool, Marion County, flowed 350 bbl. of oil in 24 hours and was completed in Mississippi lime at 2,395-2,408 ft., total depth.

Harwood Oil Co.'s No. 5 Novak, NW NE SW Section 28-17-4, found Mississippi lime at 2,468 ft., total depth 2,480 ft., and pumped 180 bbl. of oil in 24 hours.

Butler County

Reed & Glass' No. 2-A Millheisler, S½ NW NE Section 4-26-5, El Dorado field, Butler County, topped Viola lime at 2,582 ft., was bottomed at 2,605 ft., pumped 45 bbl. of oil in 8 hours, and made daily potential of 135 bbl.

E. B. Shawver's No. 1 fee, SE SE NW Section 26-29-4, wildcat, had dry Arbuckle lime at 3,328 ft., and was abandoned at 3,340 ft., total depth.

National Refining Co.'s No. 1 Lankford, SE SE NE Section 23-27-5, new Butler County wildcat, was moving in material.

Greenwood County

A. M. Landon's No. 8 Texas-Johnson, NE. SW NE Section 22-24-12, Hamilton area, Greenwood County, found Mississippi lime at 1,714-32 ft., total depth. After acid treatment, it pumped 25 bbl. of oil daily.

McPherson County

Continental Oil Co.'s No. 2 Meyers, C E½ E½ NW Section 20-21-1w, Graber field, McPherson County, found Hunton lime at 3,301-35 ft., total depth, pumped 145 bbl. of oil in 8 hours and made 24-hour potential of 437 bbl.

Tom Palmer and others' No. 1 Williams, E½ SE NE Section 32-19-5w, wildcat in McPherson County, had nothing showing in Viola lime and was dry and abandoned at total depth of 3,874 ft.

Stafford County

Seaney & Clampitt and others' No. 1 Brown, SW SW SE Section 1-21-13w, wildcat in Stafford County, topped Lansing lime at 3,243 ft., had slight showing of oil at 3,243 ft. and 3,280 ft.; had conglomerate at 3,462 ft., Arbuckle lime 3,509 ft., showings of oil in cores at 3,510-14 ft., 3,514-18 ft., and 3,532-44 ft., but was dry and abandoned at 3,591 ft., total depth.

Pratt County

Skelly Oil Co.'s No. 5 Maxedon, SE NW SE Section 25-27-11w, Cairo sector of the Cunningham field, in Pratt County, had Lansing lime at 3,429-44 ft., total depth 3,451 ft., flowed 135 bbl. of oil in 8 hours and made potential of 406 bbl. of oil.

Cowley County Deal

Hawkeye Oil Co., recently organized Tulsa firm, was preparing to start its first test in Cowley County at No. 5 Moon, NE SE SW Section 16-32-5, Frog Hollow

(Continued on Page 356)

West, Central and Panhandle Texas

By
D. H. STORMONT

Continental Starts a Second Ordovician Test in Crockett

MIDLAND, Tex., Dec. 26.—With a deep Ordovician wildcat in the process of drilling on its Todd Ranch lease in northern Crockett County, Continental Oil Co. staked location for another deep wildcat just to the northwest of the drilling well to lead the activity in the West Texas district during the past week.

The new deep location is northwest of No. 4 Todd and in the NE cor. SW¼ of Section 29, Block W.X., G.C.&S.F. Survey. The fact that the company's leases are due to expire in the event production is not obtained, or a drilling well is not in progress by the first of the year, was given as the reason for the second deep operation.

Meanwhile the Continental's No. 4 Todd, located in Section 30, Block W.X., G.C.&S.F. Survey, was plugged back from 7,010 ft., total depth, to 6,785 ft. to test upper sections. Sulfur water was encountered at the total depth. The test has plugged back through a section at 6,995 ft. which early in the week showed considerable oil, it having made a head while tubing was being pulled.

Ector County's semiwildcat activity between the Foster and the North Cowden pools continued unabated. Landreth Production Corp. and Shell Oil Co., Inc.'s No. 1-A Johnson, wildcat between the four major Ector County pools and in Section 43, Block 43, Township 1s, T.&P. Survey, is bottomed in lime at 4,310 ft. for a test of saturation at 4,260-76 ft. No estimates have been made of the show. It is believed the section is the same as the 4,318 ft. level which showed for 10 bbl. daily in a nearby wildcat test. It is understood that operators plan to carry the test to the deep Holt horizon found at about 5,200 ft. on the west side of the northern part of the North Cowden pool.

Most northern outpost for the Johnson area between the North Cowden and the Foster pools was one of two new operations listed for the link area during the week. The new outpost is I.T.I.O. Co.'s No. 1-F Johnson, ½ mile due north of the Sloan & Zook outpost producer. Location is in the SW cor. NW¼ of Section 34, Block 43, Township 1s, T.&P. Survey. Second new location for the link area was M. J. Delaney's No. 1 Johnson, ¾ mile north of a Landreth Production Corp. producer and ¼ mile east of a Sinclair Prairie Oil Co. drilling well. Location is in the SW cor. NW¼ of Section 38, Block 43, Township 1s, T.&P. Survey.

Extending production ¾ mile to the southeast on the northeastern edge of the Tubb pool of western Crane County Humble Oil & Refining Co.'s No. 33 Tubb, Section 7, Block 32, P.S.L. Survey, has been completed for 2,604 bbl. of oil daily. The pay section from 4,250 to 4,400 ft. was acidized with 4,000 gal.

Pecos County's Ordovician exploratory play centered considerable interest as the week closed with reports that Olson Drilling Co. and Bryce McCandless' No. 1 V. W. Crockett had topped the Ellenburger 100 ft. higher, structurally, than nearby control points. The No. 1 Crockett is located in Section 5, Block 110, T.C. Survey. It topped the Ellenburger at 4,405 ft. after drilling practically no detrital zone and finding no Simpson lime present. The test passed directly from Permian into Ellenburger lime. Several shows of oil have been found in the last 150 ft., both in the basic Permian and in the detrital zone. No shows have yet been found in the Ellenburger lime and the test was last reported coring below 4,416 ft.

Flush production a half mile northwest of northern Ward County's Magnolia-Sealy pool attracted considerable attention as the week closed. Mid-Continent Petroleum Corp.'s No. 4 W. Sealy, located 2,310 ft. from the south and west lines of Section 47, Block F, G.&M.M.B.&A. Survey, is shut in for storage after flowing naturally through casing at the rate of 240 bbl. hourly. The well made 100 bbl. of oil in 20 minutes of a 2-hour gage, the entire 2 hours netting 488 bbl. This is at the rate of approximately 5,760 bbl. daily. While bottomed at 3,020 ft. the well had shown considerable oil but when deepened to 3,046 ft. the flush production was uncovered. Both Mid-Continent and McQueen & Clevenger are preparing to start offsets.

Nolan County's long-drilling deep wildcat by Plymouth Oil Co. on the McClure lands, between Roscoe and Sweetwater and in Section 49, Block 23, T.&P. Survey, topped the Ellenburger at 6,965 ft. and showed 800 ft. of sulfur water on a 30-minute drill-stem test from 7,105 to 7,137 ft. It was carried to 7,340 ft. where it is shut down for orders.

North Basin

South and slightly east of the Bennett area of Yoakum County Anderson-Prichard Oil Corp. has spudded an outpost in the SW cor. Section 759. It is No. 1 Gibson (Willard) and was last reported drilling below surface casing at 263 ft.

In the extreme northeastern corner of Yoakum County Sloan & Zook's No. 1 Fitzgerald, Section 22, remains shut down for orders at total depth of 5,124 ft. After having been shut in for 24 hours the test bailed only salty sulfur water. The operators have indicated that the test may be carried deeper.

WEST TEXAS FIELD COMPLETIONS

(24-hour gages)

Andrews County

In the Means field Humble Oil & Refining Co.'s No. 72 J. S. Means, 4,400-4,500 ft., 183 bbl.

Cochran County

In the Duggan field Skelly Oil Co.'s No. 1 N. H. Tarver, 5,010-50 ft., 369 bbl.

Crane County

In the Dune field Gulf Oil Corp.'s No. 3-B State Lassiter, 3,020-3,152 ft., 167 bbl. In Waddell field Gulf Oil Corp.'s No. 28 Waddell, 3,495-3,500 ft., 9,920 bbl. In Sand Hills field Humble Oil & Refining Co.'s No. 33 J. B. Tubbs, 4,260-4,400 ft., 2,604 bbl.

Crockett County

A wildcat, Zay Kimberlin's No. 1 J. W. Robbins, dry and abandoned at 1,880 ft.

Dawson County

A wildcat, Ray Albaugh's No. 1 Dewey Hogg, dry and abandoned at 4,222 ft.

Ector County

In the Foster field Shell Oil Co., Inc.'s No. 1 E. N. Woods, 4,265-4,420 ft., 1,205 bbl. Stanolind Oil & Gas Co.'s No. 32-A E. F. Cowden, 4,025-4,160 ft., 67 bbl. No. 34-B E. F. Cowden, 4,060-4,200 ft., 1,438 bbl. Stanolind Oil & Gas Co.'s No. 35-B E. F. Cowden, 4,060-4,210 ft., 837 bbl.

In the Goldsmith field Trinity Drilling Co.'s No. 2 C. Scharbauer, 4,173-4,200 ft., 979 bbl. In the Penwell field Sinclair Prairie Oil Co.'s No. 6-79 University, 3,555-3,650 ft., 561 bbl. In North Cowden Sinclair Prairie Oil Co.'s No. 4 Fay Holt, 4,185-4,272 ft., 634 bbl.

Hockley County

In the Slaughter field Texas Co.'s No. 7 Slaughter, 4,970-5,005 ft., 474 bbl. Western State Gasoline Co.'s No. 3 Coons, 4,930-5,001 ft., 1,184 bbl.

Gaines County

In the Seminole field Atlantic Refining Co.'s No. 1-B T. S. Riley, junked and abandoned at 3,365 ft. Osage Drilling Co.'s No. 4-A Tippett, 5,075-5,336 ft., 627 bbl.

In the Wasson field Amon G. Carter's No. 4-A Moore, 4,880-5,026 ft., 618 bbl. Amon G. Carter's No. 6-E Wasson, 4,904-5,053 ft., 938 bbl. Phillips Petroleum Co.'s No. 3 Lofland, 4,815-4,995 ft., 80 bbl.

In the Cedar Lake field Stanolind Oil & Gas Co.'s No. 1 American Warehouse, 4,570-4,740 ft., 951 bbl.

Howard County

In Howard-Glasscock field Shasta Oil Co.'s No. 13 Texas Land & Mortgage Co., 2,642-2,789 ft., 1,359 bbl.

Pecos County

In the Taylor-Link field D. Breeding's No. 4 University-Humble, 1,635-1,757 ft., 48 bbl. In the Lehn area Rockdale Oil Co.'s No. 2 Sullivan, 1,662-1,735 ft., 126 bbl. In the Shearer field W. H. Street's No. 12 Shearer-Texas, 1,460-84 ft., 398 bbl.

Scurry County

In the Sharon field Blue Streak Oil Co.'s No. 2 First National Bank of Snyder, 2,260-2,450 ft., 251 bbl.

Ward County

In the Payton field W. A. Black & Sons' No. 3 Texas Cotton Industries, dry and abandoned 1,926 ft.

Winkler County

In the Halley field Skelly Oil Co.'s No. 35 Halley, 2,694-2,820 ft., 2,178 bbl. In the Kermit field Bates-Reading Oil Co.'s No. 2 C. Cowden, 2,805-2,990 ft., 245 bbl. In the Keystone field, Peck-Croft & Richardson's No. 2 Keystone, 3,330-3,464 ft., 289 bbl. Sam Weiner's No. 1-X Jenkins-Continental, 3,306-3,400 ft., 247 bbl.

Yoakum County

In the Wasson field Aloco Oil Co.'s No. 8 Wooten, 4,940-5,143 ft., 768 bbl. Honolulu Oil Corp.'s No. 4-804 Carter-Wilder, 4,980-5,165 ft., 817 bbl. Humble Oil & Refining Co.'s No. 22 Wooten, 4,959-5,120 ft., 907 bbl. Mabee Oil & Gas Co.'s No. 13 Willard, 4,975-5,185 ft., 1,320 bbl. Mabee Oil & Gas Co.'s No. 15 Willard, 4,975-5,200 ft., 1,185 bbl. Magnolia Petroleum Co.'s No. 10 Kendrick, 4,975-5,145 ft., 638 bbl. Oil Development Co. of Texas' No. 4-801 fee, 4,930-5,215 ft., 2,046 bbl. Oil Development Co. of Texas' No. 8-803 fee, 4,930-5,225 ft., 1,946 bbl. Osage Drilling Co.'s No. 1 Clawater-Amerada, 5,020-5,225 ft., 1,168 bbl. Osage Drilling Co.'s No. 3 Lynn, 5,100-5,200 ft., 522 bbl. Sinclair Prairie Oil Co.'s No. 6-A Kendrick, 5,012-5,150 ft., 485 bbl. Texas Pacific Coal & Oil Co.'s No. 26 Bennett, 5,070-5,245 ft., 1,073 bbl. Tide Water Associated Oil Co.'s No. 2 Campbell & Posey, 5,000-60 ft., 162 bbl.

WEST CENTRAL TEXAS

FORT WORTH, Tex., Dec. 26.—Near completion of one new pay-horizon opener and indications of still another, the fourth for the field, were seen for the Ivy pool of Shackelford County in the past week.

Production from the King sand appeared assured at Clyde O. Eastus' No. 1 Martin, ½ mile northwest of the pool opener. A failure in the Palo Pinto lime, the hole was plugged back to 1,950 ft. where it was given two small shots. Operators were last reported cleaning out and estimating the production at about 75 bbl. daily. The well is on a 130-acre lease in Section 16, H.&T.C. Survey.

Prospects for a pay zone in the Ivy pool below the regular Palo Pinto lime was indicated at Owens-Snebold's test in the S. M. Swenson lands, ¾ mile southwest of the pool proper. Missing the Palo Pinto lime

the test was carried to 3,278 ft. where sand was drilled to a total depth of 3,285 ft. Testing was under way as the week closed.

Speculation was still in progress concerning the validity of a new pool or an extension to the Prichard pool near Hawley in Jones County. The well, Moutray & King's No. 1 Roy E. Prichard, in the G. Martinez Survey 195, was completed two weeks ago for 108 bbl. daily from Tannehill sand at 2,086 ft. New tests are preparing to start in the area between the pool and the outpost producer, and whether or not it is a new discovery or an extension will be known in several weeks.

The scene of continuous wildcat play for the past 20 years, West Central Texas, generally, has had little or no intensive geophysical exploration for several years. Humble Oil & Refining Co. is at present active in several of the counties doing seismograph surveying. The company has been active in the southwest corner of Parker County for the past two months and has recently moved its units south for surveys in Erath, Hood, Johnson and Somervell counties.

WEST CENTRAL TEXAS COMPLETIONS

(24-hour gages)

Brown County

J. C. Homer's No. 3 Howell, 1,194-1,208 ft., 40 bbl. J. D. Kynaston's No. 1 Hill, dry and abandoned at total depth of 1,550 ft. W. M. Walker's No. 1 Strange, dry and abandoned at total depth of 464 ft.

Coleman County

Shallow Oil Inc.'s No. 1 Brown, dry and abandoned at total depth of 1,010 ft.

Eastland County

H. Ewell's No. 1 Parmer, dry and abandoned at total depth of 750 ft.

Jones County

F. Bowen's No. 1 Bigham, 1,874-93 ft., 271 bbl. in 21 hours. Fain-McGaha Oil Corp.'s No. 2 Burns, 1,934-42 ft., 100 bbl. Kimble & Bohner's No. 2 Herndon, 2,883-95 ft., 2 bbl. oil and 75 bbl. water. Moutray & King's No. 3 Pritchard, 2,082-89 ft., 104 bbl.

Palo Pinto County

A. W. Adkisson's No. 9 Costello, 2,333-38 ft., 70 bbl. Goble-Moore Drilling Co.'s No. 2-C Costello, 1,376-1,400 ft., 16 bbl.

Shackelford County

J. P. Alexander's No. 3 fee, 548-50 ft., 1,000,000 cu. ft. gas. Charter Oil & Gas Co.'s No. 5 Herrington, dry and abandoned at total depth of 1,636 ft. Georgian Oil Co.'s No. 3 Blach, 570-583 ft., 15 bbl. Georgian Oil Co.'s No. 9 Blach, 578-590 ft., 8 bbl. L. F. Hooker's No. 10 Walker, 367-375 ft., 4 bbl. Roeser-Pendleton and Continental Oil Co.'s No. 2-A-113 Cook, 1,567-80 ft., 43 bbl. Smart's No. 1 Sedwick, dry and abandoned at total depth of 582 ft.

Taylor County

J. Evans' No. 1 Sheppard, dry and abandoned at total depth of 1,752 ft. W. J. Murray's No. 4 Evans, 1,737-50 ft., 182 bbl.

PANHANDLE FIELD COMPLETIONS

(24-hour gages)

Carson County

Magnolia Petroleum Co.'s No. 68 fee (244), 3,020-85 ft., 496 bbl.

Gray County

Magnolia Petroleum Co.'s No. 6 Archer, 3,128-3,285 ft., pumped 83 bbl. Magnolia Petroleum Co.'s No. 14 Haggard, 3,240-3,300 ft., 368 bbl. Skelly Oil Co.'s No. 102 Schaffer, 3,170-3,302 ft., 331 bbl. Stanolind Oil & Gas Co.'s No. 7 Cobb A, 3,300-32 ft., 144 bbl. Shell Oil Co., Inc.'s No. 6 Hughey, 3,099-3,170 ft., 362 bbl.

Hutchinson County

Pennotex Oil Co.'s No. 3 Thompson, 2,905-3,000 ft., 441 bbl. Stanolind Oil & Gas Co.'s No. 14 Haile A, 2,990-3,090 ft., 326 bbl. Stanolind Oil & Gas Co.'s No. 22 Terry, 2,970-3,008 ft., 173 bbl. Stanolind Oil & Gas Co.'s No. 16 Ware B, 3,025-3,135 ft., 215 bbl.

Roberts County

A wildcat, Ledrick, Clark & Bullington's No. 1 Ledrick, Section 55, Block C, G.&M. Survey, dry and abandoned at unreported total depth.

Wheeler County

Columbian Fuel Corp.'s No. 4 Plummer, 2,444-48 ft., 136 bbl., pumping.

Kentucky Fields

(Continued from Page 338)

sands, total depth 1,206 ft. J. C. Miller's No. 7 Gus Morgan, 50-bbl. well in Jackson and Barlow sands, total depth 1,408 ft.; No. 8 Gus Morgan, rigging up. Handyville district: Walter Sargeant and others' No. 1 S. A. Burns, location. Master Oil Co.'s No. 1 W. W. Davis, 50-bbl. well in Jett sand, total depth 1,228 ft. Master Oil Co.'s No. 3 E. W. Richmond, dry hole through McClosky lime, total depth 1,851 ft. Red Hill district: Sunflower Oil & Gas Co.'s No. 13 R. L. Purcell, rigging up.

Henderson County, Sebree district: Joel Bailey and others' No. 1 W. R. Eakins, drilling at 50 ft.

Hancock County, Maceo district: Ohio Oil Co.'s No. 1 George Edwards, location. Easton district: W. J. Flesher's No. 2 Jane Sanders, 150,000 cu.-ft. gas well in Jackson sand, total depth 486 ft.; No. 3, drilling at 375 ft.

McLean County, South Livermore district: Cumberland Petroleum Co. and others' No. 8 D. and S. Butterfield, 15-bbl. well in McClosky, total depth 1,695 ft.

Ohio County, Sunnydale district: J. W. Tuttle and others' No. 7 Lena Berry, 5 bbl. a day from upper Pennsylvanian, total depth 164 ft. P. T. Gentry and others' No. 3 A. T. Fleener, dry hole, total depth 174 ft. William Jewell and others' No. 1 W. H. Powers, dry hole, at 250 ft. Taffy district: Jess Ashby and others' No. 2 B. M. Combs, dry hole at 850 ft.

Webster County, Tilden district: Chester Oil Co.'s No. 1 A. B. Clark, dry hole at 3,128 ft.

EASTERN KENTUCKY

ASHLAND, Ky., Dec. 26.—Only one completion is reported in the week's activities in eastern Kentucky.

Paul Williams, drilling for McCool & O'Brien, Washington, Pa., completed No. 4 Bennett in Carter County at 365 ft., in sand, and has a daily gas production of 550,000 cu. ft.

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Southwest Texas District

By
F. L. SINGLETON

Victoria Centers Attention; 2 Outposts Near Completion

CORPUS CHRISTI, Tex., Dec. 26.—Development in the Victoria field, Victoria County, was holding the attention of operators in Southwest Texas as production tests were scheduled to be made on two wells, both of which have shown promise of extending and opening production from new horizons.

W. S. Boyle's No. 1 G. C. Meyer, near the Victoria townsite, and about 1 mile northwest of the Victoria field, is standing cemented with 5½-in. casing on bottom at 4,788 ft., preparatory to perforating opposite sand at 4,776-81 ft., where a 30-minute drill-stem test at 4,776-81 ft., tested 15 lb. working pressure and 270 ft. of 26.6-gravity oil. An electrical survey and sidewall cores showed gas sand at 4,400 ft., 4,600 ft., and oil sand 4,782-86 ft. Sand showing salt water was logged at 4,786-88 ft.

Approximately 2,000 ft. southeast of the discovery well, Trinity Drillers, Inc.'s No. 1 Molar, recovered 1,140 ft. of 19.9-gravity oil on a 15-minute drill-stem test at 2,554-56 ft., and 5½-in. casing was cemented on bottom at 2,558 ft. A previous drill-stem test at 2,526-54 ft., tested 1,050 lb. working pressure in 3½ minutes.

Location for another wildcat was made in the county by John Mayo and Renwar Oil Co. for No. 1 Bayer, a projected 6,500-ft. test, 466 ft. out of the northeast corner of a 121-acre tract in the Garcia Survey, approximately 1 mile east of Dernal.

In Duval County, the Tarancahuas field was opened with the completion of Cox & Hamon's No. 1 Hoffman-Gorman, B.S.&F. Survey 115. This well was drilled to a total depth of 3,309 ft., and completed through perforated casing at 2,014-35 ft. During the first 5½ hours, the well flowed 50 bbl. of 21-gravity oil, but went dead shortly afterwards, and the operators are preparing to jet the well with gas.

In the southwest extension area of the Hoffman field Magnolia Petroleum Co. completed No. 3 Weil as a gas well. Casing was perforated at 2,690-95 ft., and the well flowed an unestimated amount of dry gas. This is the third well drilled in the area, two of which are gas wells and the other a small crude-oil producer.

In Webb County a production test was scheduled to be made on W. C. McBride, Inc.'s No. 1 Laurel Brothers, Block 5, Survey 719. Sand with an oil odor was logged at 2,071-74 ft., and 2,340-55 ft., and casing was cemented for the production test after the hole was drilled to a total depth of 2,717 ft.

Drilling activity in the shallow Adami field, Webb County, has been responsible for an increase in activity in the Laredo district. There are more than 10 wells drilling in the field, and locations are being made each week. Production is from sand at approximately 980-1,000 ft., with the average production of each well ranging from 30 to 75 bbl. per day, pumping.

In the Bruni field, Webb County, Tide Water Associated Oil Co. was preparing to perforate drill pipe for a production test of the Queen City formation in No. 7 Bruni. This well was drilled to the Tertiary Wilcox formation and attempted to blow out at a total depth of 8,959 ft. Due to mechanical trouble caused by the excessive gas pressures, no test was made of the Wilcox, and the hole was plugged back to test the 5,600-ft. sand, which is reported to have shown gas and distillate.

Approximately 1 mile north of the Robstown field, Nueces County, Fred W. Shield and others staked location for a deep test on the C. E. Meinholdt lease in the M. L. De Herrera grant.

Wellington Oil Co. and Seaboard Oil Co.'s No. 1 Martin, 1 mile east of the South Clara Driscoll field, Nueces County, flowed 320 bbl. per day through a ¼-in. choke with casing pressure 275 lb. and tubing pressure 925 lb. This well was drilled to 6,701 ft., and completed through perforated casing at 5,255-63 ft. In the same county and east of the Clara Driscoll field, Wellington Oil Co. and Pan American Production Co.'s No. 1-B Driscoll, is reported to have been completed on the pump for a production of 195 bbl. in 18 hours. Production is from perforated casing at 5,292-5,300 ft.

Production from a new sand was opened in the Richard King field, Nueces County, by Southern Minerals Corp.'s No. 11-B Richard King, completed for an initial production of 62 bbl. per day, flowing through a ⅛-in. choke from perforated casing at 5,593-94½ ft. The hole is bottomed at 5,750 ft. Previous testing at 5,530-38 ft. tested salt water. This is the fifth and deepest producing horizon in the field.

Clyde Echols and others opened a shallow gas field in Karnes County, with the completion of No. 1 J. F. Newberry, about 3½ miles southeast of Green in the Carlos Martinez Survey. The well was drilled to 3,012 ft., and completed as a dry-gas well through perforated casing at 2,942-49 ft. Tubing pressure was 435 lb. and casing pressure 555 lb.

SOUTHWEST TEXAS COMPLETIONS IN PROVEN FIELDS

Aransas-San Patricio Counties

McCampbell field: Texas Atlas Corp.'s No. 1 Conn-Brown, perforated casing 7,118-24 ft., 122 bbl., ¼-in. choke.

Caldwell County

Salt Flat field: Stroburg and Wolf's No. 4-A Moses, 2,677½ ft., 60 bbl. oil, 30 bbl., water, pumping.

Calhoun-Victoria Counties

Heyser field: Gulf Oil Corp.'s No. 28 Traylor, 5,479 ft., 40 bbl., ¼-in. choke. Humble Oil & Refining Co.'s No. 23-B Welder, 5,593 ft., 281 bbl., ¼-in. choke.

Duval County

Casa Bianca field: Magnolia Petroleum Co.'s No. 1 D.C.R.C., 2,103 ft., dry and abandoned. Eagle Hill field: W. Butler's No. 8-B Foster, 2,205 ft., dry and abandoned. Government Wells field: Tom Graham's No. 5 Webb, perforated casing 1,540-46½ ft., 65 bbl. fluid, 25 per cent salt water, pumping. Hoffman field: Cuellar Brothers' No. 4-B fee, sand 2,771-95 ft., 40 bbl., jetting. Duval Oil Corp.'s No. 1 Hoffman, sand 2,723-34 ft., 60 bbl., 12 hours, jetting. Longhorn field: Hiawatha Oil & Gas Co.'s No. 4 Denman, perforated casing 4,064-78 ft., 121 bbl., 5/32-in. choke. Lundell field: Government Wells Oil Co.'s No. 40 Lundell, sand 1,543-53 ft., 76 bbl., 12 hours, ⅛-in. choke. Piedra De Lumbre field: Magnolia Petroleum Co.'s No. 46 D.C.R.C., sand 2,114-29 ft., 225 bbl., ⅝-in. choke. Rancho Solo field: Charles Andrus' No. 1 Peters, perforated casing 1,864-82 ft., 44 bbl., pumping. Seven Sisters field: Wellington Oil Co.'s No. 20-C Welder, sand 2,536-41 ft., 70 bbl., 10 hours, jetting.

Guadalupe County

Darst Creek field: Bluehawk Oil Co.'s No. 5 Richburg, 2,612 ft., 57 bbl., oil and 66 per cent salt water, pumping.

Jim Hogg-Brooks Counties

Kelsey field: Humble Oil & Refining Co.'s No. 38 McGill, 4,729 ft., 158 bbl., 9/64-in. choke. Colorado field: Colorado Octane Co.'s No. 2 Trevino, sand 3,024-38 ft., 75 bbl., ⅛-in. choke, jetting.

Jim Wells County

Ben Bolt field: H. J. Mosser's No. 4 Pearles, perforated casing 5,233-71 ft., 95 bbl., 3/32-in. choke. La Gloria field: Magnolia Petroleum Co.'s No. 1 Stolze, perforated casing 7,000-10 ft., 197 bbl., ⅝-in. choke. Reynolds field: Texas Gulf Producing Co.'s No. 3-B Pustejuvsky, location abandoned. Texas Gulf Producing Co.'s No. 11-A Miller, 5,180 ft., dry and abandoned. South Alice field: Tom Graham Oil Co.'s No. 2-A Bankers Mortgage, perforated casing 5,348½-51½ ft., 117 bbl., ⅛-in. choke. Tom Graham Oil Co.'s No. 2-C Bankers Mortgage Co., perforated casing 5,353-56 ft., 109 bbl., ⅛-in. choke. Gravis and Mull's No. 1 Mull, perforated casing 5,308½-12 ft., 66 bbl., 13 hours, ⅛-in. choke.

Refugio County

La Rosa field: Benson and Jones No. 4-A Rooke, perforated casing 5,412-20 ft., 156 bbl., ⅛-in. choke. Hewitt and Dougherty's No. 9-B Rooke, perforated casing 5,713-23 ft., 162 bbl., ⅛-in. choke. Tomoconnor field: Quintana Petroleum Corp.'s No. 7-B Williams, perforated casing 5,820-28 ft., 726 bbl., ¼-in. choke.

San Patricio County

East White Point field: O. W. Killam's No. 2 Taft, perforated casing 5,575-79 ft., 173 bbl., ⅛-in. choke. Plymouth Oil Co.'s No. 1-A Copeland, perforated casing 5,655-71 ft., 163 bbl., 7/64-in. choke. Plymouth Oil Co.'s No. 1 Koonce, perforated casing 5,646-60 ft., 132 bbl., 7/64-in. choke. R. A. Welch's No. 6 fee, sand 5,660-78 ft., 150 bbl., 7/64-in. choke. Plymouth field: Plymouth Oil Co.'s No. 114-C Welder, perforated casing 5,649-57 ft., 55 bbl., jetting. Texon Royalty Co.'s No. 6 Rambo, perforated casing 5,639-47 ft., 156 bbl., 5/32-in. choke.

Starr County

Sun field: Sun Oil Co.'s No. 2-A Montalvo, perforated casing 4,828-39 ft., 72 bbl., 9/64-in. choke. Sun Oil Co.'s No. 4 Speer, perforated casing 4,976-80 ft., 69 bbl. of oil and 7 bbl. of water, 5/32-in. choke.

Webb County

Adami field: J. McClintock and others' No. 1 Adami, sand 983½-85 ft., 40 bbl., pumping. Dan Purvis' No. 1 Adami, sand 1,007-12 ft., 35 bbl. fluid, 20 per cent salt water, pumping. Dan Purvis' No. 2 Adami, sand 1,005-07 ft., 40 bbl., pumping. Red Bank Oil Co.'s No. 5 Adami, sand 1,002-03½ ft., 32 bbl., pumping. Volpe field: Magnolia Petroleum Co.'s No. 13 Volpe, sand 2,460-80 ft., 80 bbl., pumping.

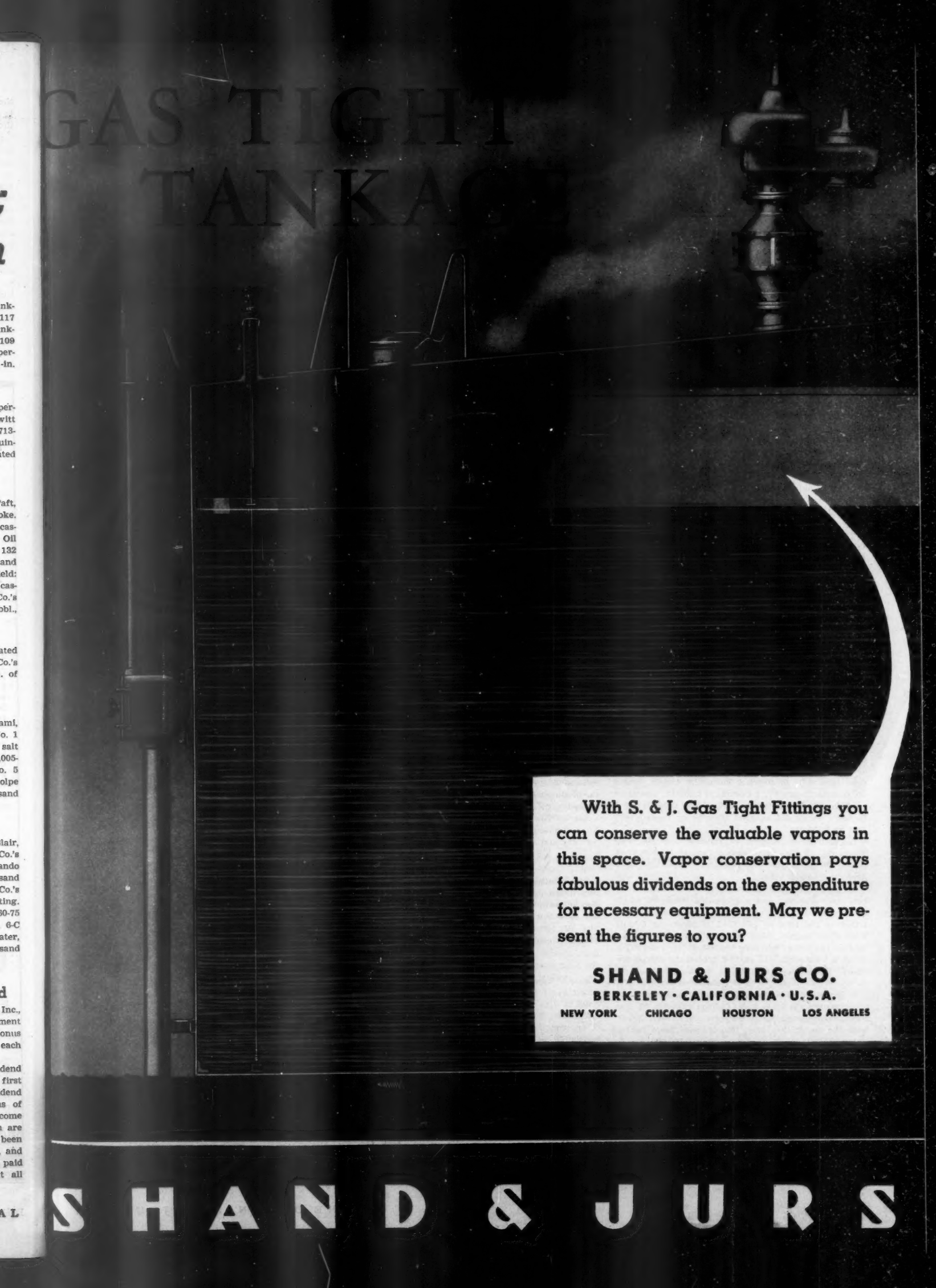
Zapata County

Escobas field: George Buck's No. 7 Trevino-Blair, sand 1,384-91 ft., 75 bbl., pumping. Dulup Oil Co.'s No. 3-C Trevino, 1,360 ft., dry and abandoned. Mirando Valley field: Buffalo Oil Co.'s No. 20-C Hinnant, sand 1,890-1,909 ft., 158 bbl., ⅝-in. choke. Buffalo Oil Co.'s No. 21-C Hinnant, sand 1,907-21 ft., 82 bbl., jetting. Interstate Minerals, Inc.'s No. 7-C Lopez, sand 1,760-75 ft., 60 bbl., jetting. Interstate Minerals, Inc.'s No. 6-C Lopez, 1,788 ft., 30 bbl. of oil and 100 bbl. of water, pumping. Interstate Minerals, Inc.'s No. 18 Lopez, sand 1,768-81 ft., 10 bbl., ⅛-in. choke.

W-K-M Co. Bonus and Dividend

Announcement is made by the W-K-M Co., Inc., manufacturers of oil-field equipment, of the payment of a cash bonus to each of its employes, this bonus being somewhat in excess of 2 weeks average of each employe for the 1939 period.

W-K-M has also declared and paid a cash dividend on each class of outstanding stock—preferred, first preferred, common and Class A common—this dividend being payable to each stockholder on record as of December 16, 1939. Previously issued dividend income notes, together with accumulated interest thereon are all being retired. Very satisfactory progress has been made by the company for the past several years, and it now has no old obligations outstanding, having paid off all certificates of indebtedness and brought all obligations up to a current basis.



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Michigan Field Report

14 New Oil Wells in Kent-Ottawa Field; 23 in State

By
O. C. PRESSPRICH

SAGINAW, Mich., Dec. 26. — Michigan oil development took forward strides last week as 37 completions were recorded. Although there were no outstanding new wells, better-than-usual success was had as 23 were rated as commercial oil wells. Twelve holes were abandoned as dry.

The Kent and Ottawa counties field was the principal scene of activity, recording 14 new oil wells and 2 dry holes. It was in Kent's Walker Township, 7n-12w, that the locations were discarded. Allegan County had one of its best weeks in the past few months as four producers, two of them rating 700 bbl. each, were added, while four other tests were failures.

New potential production was increased 4,775 bbl. a day as a result of the week's activities, the new production including output from one new well in Clare County, two in Isabella and one in Monroe. Considerable wildcatting also was under way, but resulted in little of importance.

The Kent-Ottawa play, for the most part, was in the well-proven areas of the field, Walker's Section 33 being the scene of the most prolific of the new wells, Swanson Consolidated Oil Co.'s No. 6 Slykhouse rating 840 bbl. a day.

In Clare County the Pure Oil Co.'s No. 1 Zink was completed at 200 bbl. after acid, in Redding Township, 19n-6w, but Oil Well Drilling Co. went to 4,148 ft. in Section 4 of Surrey, 17n-5w, and failed to get results from No. 1 Duval. McClanahan Oil Co. was completing No. 1 State-Redding in Section 29 of Redding and it was planned to acidize as the hole filled with 2,000 ft. of oil. Sun Oil Co. has started on a wildcat test in Hamilton Township, 19n-3w.

Another Tuscola County producer was completed in Wisner Township, 14n-7e, as Frank Norton got natural production of better than 162 bbl. a day from No. 1 McPherson in Section 24.

The pickup in activity was reflected in Allegan County where eight completions were divided equally as to production and dry holes. Best of the producers were two wells in Overisel Township, 4n-14w, where W. Spencer Cook's No. 1 Costen, at 1,466 ft., was rated good for 700 bbl. naturally while Jacob Bolem's No. 1 Browder estate did as good after being treated with acid at 1,510 ft.

Increasing development in Isabella County's Wise Township, 16n-3w, is featuring Central Michigan activity. The week saw two producer completions, both moderately good wells.

Michigan gas field developments were marked by two new producers and a deepening operation which more than doubled initial open flow. Acreage was added to the Edmore gas field in Montcalm County with E. C. Daily's No. 1 Johnson estate, SW SE NE Section 13-12n-6w, initialing 500,000 cu. ft. a day. It is about a mile north and east of previously proven territory. Producing 5,150,000 cu. ft. a day from the Berea, W. E. Ross' No. 1 Buffalo Land Co., SW NW NW Section 10 of Arenac's Clayton Township (20n-4E), was completed at 1,149 ft. In Clayton's Section 15, Don Rayburn deepened No. 1 Bergeron 24 ft. to 1,286 ft. with the result that open flow jumped from its initial 4,000,000 cu. ft. to better than 9,000,000 cu. ft. Lang & Lewis, Inc., resumed drilling operations, which had been halted at a little over 900 ft. depth, on No. 1 Forquer in Section 32 of Gratiot's Sumner Township (11n-4w).

The past week also witnessed a slight pickup in projected drilling as the state Conservation Department issued 30 new permits for oil and gas exploitation. The list included 11 Kent County franchises, 10 for Ottawa, 2 each for Van Buren and Allegan, 1 each for Mecosta, Monroe, Mason, Jackson, and Isabella. As a result the total of permits issued this year was increased to 1,410.

Summary of last week's completions:

Allegan County

Laketon Township (4n-16w)—Twin Drilling Co.'s No. 1 Ed Plasman, SE SW SW Section 24, was abandoned as dry at 1,470 ft.

Overisel Township (4n-14w)—W. Spencer Cook's No. 1 Hattie Costen, SE NE NW Section 34, completed at 1,466 ft., was rated good for 700 bbl. a day naturally, while Jacob Bolema's No. 1 John Brower estate, NW NW NE Section 34, also rated 700 bbl. a day after it was acid treated. Completion depth is 1,510 ft.

Salem Township (4n-13w)—Freeman Oil Co.'s No. 1 J. J. Vogt, SW NE NW Section 12, was abandoned as dry at 1,613 ft. Voorhees Drilling Co.'s No. 3 J. Shoemaker estate, SE NW NW Section 12, was good for 35 bbl. a day after it was acidized at 1,613 ft. Bridger-Basin Oil Corp.'s No. 1 Bridewig, NE SW SW Section 15, completed at 1,590 ft., rated 75 bbl. a day after an acid treatment.

Saugatuck Township (3n-16w)—DeVries & Boeve's No. 1 Forrester, NE SW SW Section 15, was dry and abandoned at 1,320 ft.

Watson Township (2n-12w)—A. S. Cochran's No. 1 Walter Kent, SW SW SW Section 2, failure as a wildcat test, was abandoned at 1,938 ft.

Arenac County

Clayton Township (20n-4e)—W. E. Ross' No. 1 Buffalo Land Co., SW NW NW Section 10, was completed at 1,149 ft. as a gas well producing at the rate of 5,150,000 cu. ft. a day.

Barry County

Assyria Township (1n-7w)—Strange Oil & Gas Co.'s No. 1 Earl D. Olmstead, NE NE NE Section 2, failed as a wildcat test, being abandoned at 1,948 ft.

Clare County

Redding Township (19n-6w)—Pure Oil Co.'s No. 2 John Zink, C N½ SE SE Section 27, completed at 3,892 ft., produced at the rate of 200 bbl. a day after being treated with acid.

Surrey Township (17n-5w)—Oil Well Drilling Co.'s No. 1 Edmore State Bank, C W½ NW NW Section 4, was dry and abandoned at 4,148 ft.

Isabella County

Wise Township (16n-3w)—Gulf Refining Co. production division's No. 1 Albert Reed, SW NW SW Section 16, completed at 3,710 ft., was good for 150 bbl. a day after it was acidized. Cities Service Oil Co.'s No. 1 Tice, SE NE NE Section 29, produced 190 bbl. a day, naturally, completion depth 3,705 ft.

Kent County

Sparta Township (9n-12w)—J. W. McIntosh abandoned No. 1 Minnie Huber, SE SE SW Section 30, at 2,405 ft.

Walker Township (7n-12w) — Fisher-McCall and others completed No. 3 W. E. Sackner, NE SW NE Section 29, at 1,924 ft. to get after-acid production of 60 bbl. a day, but abandoned location for No. 2 Sackner and No. 4 Sackner in the same section. Wolverine Natural Gas Corp.'s No. 2 George Kniff, NE SW SE Section 29, had after-acid potential of 75 bbl. a day, total depth 1,905 ft. The same company's No. 1 Walker Township-George Kniff, NW NW SE Section 29, rated 105 bbl. a day after an acid treatment, at 1,902 ft. Mesel & Spielberg's No. 1 Snyder, NE NE NE Section 32, acidized, was completed at 1,937 ft. and was good for 80 bbl. a day. Smith Petroleum Co.'s No. 1-B George Engelsma, SE SW NW Section 32, had after-acid production of 75 bbl. a day at 1,852 ft. Swanson Consolidated Oil Co.'s No. 6 Slykhouse, NW SW SE Section 32, is a 100-bbl. well, and No. 7 Slykhouse, NW NW SE Section 32, also started at 100 bbl. daily. Completion depth of No. 6 was 1,915 ft., and No. 7, 1,904 ft. Wolverine Natural Gas Co.'s No. 1 Schofield-Kilbourne, NW NW NW Section 33, completed at 1,916 ft., was good for 364 bbl. a day after it was acidized, while James E. Flanagan had the best completion of the week in No. 1 Edward Slykhouse, Jr., C SW NW Section 33. After an acid treatment its initial was 840 bbl. a day. Completion depth was 1,911 ft.

Monroe County

Summerfield Township (7S-6e)—A. V. Oil & Gas Co.'s No. 1 Amelia Duval, SW NE NW Section 31, completed at 2,110 ft., produced naturally at the rate of 190 bbl. a day.

Montcalm County

Home Township (12n-6w)—Natural gas output was 500,000 cu. ft. a day from E. C. Daily's No. 1 Griffin Johnson estate, SW SE NE Section 13, completed at 1,294 ft.

Osceola County

Sylvan Township (18n-7w)—Michigan Devonian Petroleum Co.'s No. 1 J. W. Reedy, C N½ SE NW Section 4, a wildcat, was abandoned at 1,858 ft.

Ottawa County

Holland Township (5n-15w) — Joseph Malloy and T. P. Rau's No. 1 Regnerus-Potts, C S½ SW SW Section 16, was dry and abandoned at 1,594 ft.

Tallmadge Township (7n-13w)—Basin Oil Co. and Abe Snyder's No. 3-A John E. Connell, SE SW SE Section 24, was good for 35 bbl. a day after it was acidized. W. R. Borough and others' No. 3 Elizabeth Brady, SE NW NE Section 25, completed at 1,900 ft., was good for 125 bbl. a day, naturally. W. R. Borough and K. A. Fox completed No. 2 Brady, NE SW NE Section 25, at 1,898 ft., getting 100 bbl. a day, naturally. Fisher-McCall Oil & Gas Corp.'s No. 2 M. Goodale, SW SE SE Section 25, completed at 1,908 ft., rated 5 bbl. a day, naturally, and Gordon Oil Co.'s No. 2 Heyboer Communitized, C Section 25, was good for 285 bbl. a day after acid treatment at 1,860 ft.

Tuscola County

Wisner Township (14n-7e)—Frank Norton completed No. 1 Harriette McPherson, SW SE SE Section 24, at 3,453 ft., getting 162 bbl. a day, naturally.

Van Buren County

Antwerp Township (3s-13w) — Union Oil Co. and others' No. 1 Mary McNulty, NE NW SE Section 13, was dry and abandoned at 1,496 ft.

Columbia Township (1s-15w)—J. F. McGovern, trustee, abandoned No. 1 Glenn Niles, SE NW SW Section 24, at 518 ft., and Miller Brothers' No. 1 Foster, SE SE NW Section 11, was dry and abandoned at 1,208 ft.

Third Recycling Plant Planned For Grapeland Field

FORT WORTH, Tex.—Plans for a third recycling plant in the Grapeland gas-distillate area of north Houston County were announced last week. Site was acquired last week by Grapeland Oil Co., Abilene, Tex., a 70-acre tract on the J. W. Ellison farm in Josiah Herod Survey, 3 miles northwest of Grapeland. Size of the plant was not announced. The second plant in the field, that of Lone Star Gasoline Co. and Trinity Gas Co., is to be started in the near future. Minimum capacity will be 30,000,000 cu. ft. daily.

Oklahoma Operations

By DAL DALRYMPLE

Wildcat to Seek Wilcox Sand On Trend North From Ramsey

Work was started the day after Christmas at Gardner Petroleum Co. and others' No. 1 Ahrberg, NE SW SE Section 2-18-1e, Payne County, a wildcat in one of the more interesting Oklahoma areas. Location was announced last week by James H. Gardner, president of the operating company, and on December 26 the Summitt Drilling Co., which has the contract, began laying lines and clearing roads to the site. Wilcox sand will be the objective.

The wildcat is located north of the Ramsey pool, on a trend north-northwest from that rich area. The area has been seismographed and geologized by Mr. Gardner and others. It is on a lease block of about 1,160 acres, in Sections 1, 2, 11 and 12-18-1e and Sections 34 and 35-19-1e. The Petroleum Exploration Co., Inc., of Dallas, Tex., has an interest in the well and surrounding acreage. The contracting company also has an interest in the test. Wilcox pay is expected at around 4,760-4,800 ft.

Continental Oil Co. was ready to abandon its No. 1 Proctor, C NW¼ Section 28-10-20w, Washita County, deepest test to be drilled in the state. It was drilled to total depth of 14,582 ft., where operations were halted by an unsuccessful fishing job. Efforts to develop production through perforations between 10,715 ft. and 11,192 ft. were unsuccessful. It is said to be the second deepest test ever drilled, the record being 15,005 ft., made in a California well. Fain Drilling Co. of Oklahoma City had the contract.

Patsy Oil Co.'s No. 1 Bond, NW NE NE Section 16-5-3e, wildcat that recently opened the Byers pool in McClain County, flowed 227 bbl. of oil in 5 hours through ¼-in. choke on recent test. Production is from Viola lime at 3,490-3,623 ft., total depth. The oil is being trucked to a loading station at Bebee, where it goes into Stanolind Pipe Line Co. lines. Work was started at two offset locations.

Among the Wildcats

Magnolia Petroleum Co.'s No. 1 Amyx, NW NW SE Section 17-3s-16w, wildcat southeast of Frederick in Tillman County, penetrated Arbuckle lime at 5,653 ft. and was dry and abandoned at 5,811 ft., total depth. McLish formation was found at 5,210 ft.

Johnson's No. 1 Baker, C SE NW Section 35-2s-6w, Stephens County wildcat south of the Woolsey pool, topped Arbuckle lime at 1,950 ft. and was dry and abandoned at 2,021 ft., total depth.

Royalty Service Co.,'s No. 1 Poynter, NE NW NE Section 4-20-6, wildcat in the Maramec district, Pawnee County, had sand at 3,475-3,530 ft., sand and lime at 3,530-40 ft., where Arbuckle lime was topped, and was dry and abandoned there.

Zephyr Drilling Co.'s No. 1 High, NW NE NW Section 24-26-2w, wildcat south of the Hubbard pool in Kay County, found Wilcox sand at 4,127-45 ft., total depth, and was dry and abandoned.

Senora Oil & Gas Co. and others' No. 1 Warren, NW NW SE Section 35-6-8, wildcat in Hughes County and north of the Allen field, topped Gilcrease sand at 3,390 ft., had sandy lime at 3,498 ft. and was dry and abandoned at 3,502 ft.

Magnolia Petroleum Co. was starting a new wildcat in the same section at No. 1 Warren, NE SW SE Section 35-6-8. Rotary tools were being rigged up for a Senora-sand test.

Work was started at Whiting's No. 1 Patchin, NE NW NW Section 28-7-18w, north of the town of Hobart and west of the Hobart pool. Ten-inch casing was set at 48 ft. and it was waiting on cement.

Pottawatomie County

Sinclair Prairie Oil Co.'s No. 7 Deatheridge, SE NW NW Section 28-7-4, St. Louis field, Pottawatomie County, drilled Wilcox sand at 4,334-47 ft., total depth, and was completed for daily potential of 795 bbl. of oil, with 240 bbl. of water.

J. F. Smith's No. 2 Latimer, SW NW NW Section 21-7-4, penetrated Earlsboro sand at 3,481-96 ft., was bottomed at 3,509 ft., shot and swabbed 50 bbl. of 34-gravity oil in the first 24 hours.

T. C. Iglehart's No. 1 Phillips B, NW SW NE Section 4-6-5, southeast side of the St. Louis district, set 7-in. casing at 4,135 ft., on top of dolomite, was bottomed at 4,165 ft. and acidized with 5,000 gal. It swabbed 250 bbl. of oil and 1,500 bbl. of water in 24 hours and pumped 25 bbl. of oil and 1,000 bbl. of water in the next 24 hours.

Phillaine Oil Co.'s No. 1 Garrett, SE SE NW Section 28-7-4, an old well, was deepened from 4,175 ft. to Wilcox sand at 4,317 ft., total depth 4,324 ft., swabbed 400 bbl. of oil in 24 hours and pumped 227 bbl. in 24 hours. Gravity of the oil was 42°.

J. F. Smith's No. 1 Schrader, C N½ NW NE Section 9-6-5, was an abandoned location.

Alma Oil Co.'s No. 3 Johnson, SE NW SW Section 19-6-5, Gray area, drilled sand at 2,865-80 ft., total depth 2,900 ft., was shot, flowed 323 bbl. of oil the first 24 hours and was completed for daily potential of 303 bbl. Gravity of the oil was 38°.

Ray Dunnett's No. 1 Menser, NE SE SW Section 31-11-4, Shawnee pool, had erected derrick. R. Olsen Oil Co. and others' No. 5 Gillis, NW SW NW Section 5-10-4, was drilling below 2,275 ft. Elmer Panner and others' No. 1 Johnson, SW SE SW Section 27-6-3, wildcat near Asher, was drilling below 2,850 ft.

Seminole County

Summers Co.'s No. 1 Caesar, SW SW SW Section 21-6-6, an old well in the Konawa district, Seminole County, was deepened from 3,600 ft. to 3,685 ft., acidized, pumped 150 bbl. of oil and 350 bbl. of water in 24 hours and was recompleted.

Wood Oil Co. and Atlantic Refining Co.'s No. 1 Crow, SE SE SE Section 31-8-6, wildcat in the Bowlegs area, was making hole below 2,270 ft. Magnolia Petroleum Co.'s No. 2 Dixon-Ligon, NE SE SW Section 24-8-7, Wewoka area, was drilling below 1,000 ft.

Hughes County

Hugh Canavan's No. 1 Burke, C NW NE Section 8-8-10, an old well in the North Yeager field, Hughes County, was deepened from 3,200 ft. to Wilcox sand at 4,165 ft., found second sand at 4,220-30 ft., total depth, ripped casing, the hole filled with water, and it was abandoned.

Creek County

Rufley's No. 2 McMilton, SE NW NW Section 26-18-7, Cushing field, Creek County, was completed for 3,500,000 cu. ft. of gas daily in lime at 580-84 ft., total depth.

Service Pipe Line Co.'s No. 6 McIntosh, NW NE NW Section 26-18-7, drilled broken sand at 860-90 ft., total depth, and was dry and abandoned.

Carter County

A 2-bbl. pumper was completed at Kiester's No. 1 Cox-Harley, SE SE SW Section 19-2s-3w, in the Carter County sector of the Milroy field. It found sand at 354-71 ft., total depth.

Jackson County

Vaughn's No. 1-A Cole, NE NW NW Section 3-1n-20w, Altus field, Jackson County, set 7-in. casing at 1,415 ft., was bottomed at 1,657 ft., and pumped 35 bbl. of oil and 1 bbl. of water daily.

Gulf Oil Corp.'s No. 3 Barrett, NE NE SW Section 10-1n-20w, was completed at 1,542 ft., total depth, pumping 45 bbl. of oil in 14 hours.

Kerbow's No. 1 Hunter, NE NE SW Section 6-1s-19w, Tipton area, had granite wash at 2,652-57 ft., and was dry and abandoned at 2,670 ft.

Same operator's No. 2 Hunter, NW NW SW Section 6-1s-19w, had a hole full of water and was abandoned at 2,784 ft., total depth.

Estimated Daily Production

Estimated daily production for Oklahoma for the week ended December 23, and for the preceding week was as follows:

	Barrels	
	Dec. 23	Dec. 16
Allen	6,100	6,125
Billings	6,350	6,325
Burbank	7,150	6,925
South Burbank	8,650	8,750
Balance Osage	18,250	18,250
Blackwell district	3,675	3,675
Bristow-Slick	6,325	6,325
Chandler	1,450	1,475
Crescent	2,375	2,350
Cromwell	2,875	3,050
Cushing-Shamrock	9,650	9,650
Duncan	3,725	3,725
Edmond	4,575	4,350
Fish	3,775	3,775
Fitts	21,300	21,000
Jesse	2,275	2,025
Graham-Fox	2,275	2,850
Gray	750	750
Healdton	9,025	9,075
Hewitt	3,875	3,925
Keokuk	3,000	3,075
Konawa	1,150	1,050
Lucien	8,425	8,100
Moore	2,550	2,600
Oklahoma City	109,150	108,900
Olympic	2,525	2,650
Ramsey	5,200	4,975
Sasakwa	1,750	1,775
Sholem-Alechem	2,925	2,925
Seminole district:		
Bowlegs	7,075	6,850
Carr City	2,375	2,075
Dora	2,550	2,500
Earlsboro	4,325	4,075
South Earlsboro	550	500
East Earlsboro	2,175	2,150
Little River	6,375	5,875
East Little River	875	725
Maud	625	575
Mission	1,225	1,250
Seminole	7,075	6,825
East Seminole	1,075	1,125
Searight	1,975	1,850
Total Seminole	38,275	36,375
St. Louis-Pearson	33,500	30,750
Tatums	2,150	2,350
Tonkawa-Garber-Thomas	4,025	4,025
Wewoka	1,650	1,700
Yale-Jennings	3,550	3,525
Other pools	91,525	93,050
Total Oklahoma	435,775	432,300

Payne County

Mid-Continent Petroleum Corp. and others' No. 8 Wetzel, NW NE SE Section 13-18-1e, Ramsey pool, Payne County, was completed in Wilcox sand at 4,756-78 ft., total depth. It flowed 473 bbl. of oil in 2 hours and made a 24-hour potential of 5,577 bbl.

In the Coyle field Texas Co.'s No. 1 Carr, C W½ SW NE Section 12-17-1e, flowed 83 bbl. of oil in 24 hours after a shot. Production was from Wilcox sand at 4,859-83 ft., total depth.

Mul-Berry Oil Co.'s No. 9 Broyles, NE NW NW Section 26-18-4, Broyles area, found Wilcox sand at 3,820-33 ft., total depth, and flowed 155 bbl. of oil in 24 hours.

Logan County

Carter Oil Co.'s No. 2 Herron, C NE NE Section 28-17-4w, an old well in the Crescent field, Logan County, was plugged back to 5,135 ft., ripped casing, the hole filled with water and it was abandoned.

Garfield County

Sinclair Prairie Oil Co.'s No. 45 West Kisner, NW

SW NW Section 19-22-3w, Garber field, Garfield County, had first Hoy sand at 1,136 ft., second sand at 1,160-1,210 ft., total depth, and pumped 10 bbl. of oil daily.

Grady-Comanche Counties

Magnolia Petroleum Co.'s No. 1 Harrison, NE SE NE Section 23-3n-5w, an old well in the Knox pool, Grady County, was deepened from 2,044 ft. to sands at 2,468-75 ft. and 2,512-21 ft., total depth, pumped 55 bbl. of oil daily and was recompleted.

In the Hanbury area, Comanche County, W. & N. Co.'s No. 3 Watson, SW NE NE Section 24-2n-10w, an old well, was plugged back from 1,875 ft. to 1,872 ft. after deepening from 1,240 ft., pumped 10 bbl. of oil and 20 bbl. of water, pumped off, and was dry and abandoned.

Carl Carter's No. 1 Parker, SE NE NE Section 16-1s-5w, Velma area, Stephens County, had sand at 740-45 ft., total depth, and produced 6,750,000 cu. ft. of gas, with 200 lb. rock pressure.

Kiester's No. 1-A Wilkerson, NE SE NE Section 16-1s-5w, found sand at 502 ft., total depth 603 ft., plugged back to 526 ft., and pumped 10 bbl. of oil daily.

Kansas Fields

(Continued from Page 349)

area. Location is on acreage included in a deal by which the Hawkeye company bought some of the properties of W. M. McKnab, Windfield operator, in the Frog Hollow, Hittle and Zyba areas for approximately $600,000. Zephyr Drilling Co. has the contract for the new well. Mr. McKnab retains an eighth interest in the properties he sold and will continue to operate in Kansas fields. Capital stock of the Hawkeye company is owned by Waite Phillips, his son, Elliot Phillips and R. Otis McClintock, all of Tulsa.

Forest City Basin Activity

ST. JOSEPH, Mo., Dec. 26.—Nebraska's first producer, the Pawnee Royalty Co.'s No. 1 Boice, C NE NE Section 18-1n-16, near Falls City, Richardson County, was due to resume testing this week. A caving hole caused suspension of production. Eight-inch casing was lowered from 2,440 ft. to 9 in. off bottom of the 2,287-ft. hole. Hunton lime was topped at 2,279 ft. The hole may be deepened a few feet before resumption of testing. The company's other well, No. 1 Meyer, C NW NW Section 24-1n-15e, was reported drilling at about 2,000 ft., with formations checking about the same as in No. 1 Boice, 1¾ miles northeastward. Cellar was dug for a new Richardson County wildcat at Uhri, Stephens & Higgins' No. 1 Ogle, SW NE SW Section 9-1n-14e, ¼ mile northwest of the old Arab Petroleum test.

In Union County, Iowa, Phillips Petroleum Co. was underreaming 13⅜-in. casing from 1,107 ft. in its No. 1 Creston, C SE NE Section 31-71-30w. Casing was to be set at 1,260 ft. Mississippi lime was expected at around 1,300 ft.

Some free green oil was found at 890 ft. in Vincent & Roach's No. 1 Dillingham, C NE SW Section 16-53-34w, Platt County, Missouri. Ten-inch pipe was set at 890 ft. and the crew was drilling below 1,005 ft., looking for Mississippi lime. Bob Miller and others' No. 1 Corrough, C SE SE Section 24-57-35w, Buchanan County, Missouri, set 8-in. pipe at 1,898 ft. and shut down until after the holidays.

Missouri operations: Missouri Valley Gas & Oil Co.'s No. 1 Long, SE cor. Section 7-51-33w, Platte County wildcat, had Squirrel sand at 549-607 ft., total depth 935 ft., and produced 200,000 cu. ft. of gas. H. H. Francis' No. 1 Lewis, SW NW SW Section 28-59-27w, Daviess County, was dry and abandoned at 770 ft. Ward McGinnis' No. 1 Laughlin, SW SE SW Section 18-62-15w, had Arbuckle lime at 1,345 ft., and was dry and abandoned at 1,623 ft., total depth. J. Bradford's No. 1 Renner, NW NE SW Section 5-50-33w, Platte County, was drilling below 465 ft.

Russian Gasoline Cache

EDMONTON, Alta.—Should Soviet Russia be drawn into the war, Canada will promptly take steps to seize some 1,800 gal. of high-grade airplane fuel, the property of the Soviet Government, cached for 2 years at Aklavik, at the mouth of the Mackenzie River. The gasoline was taken by airplane to the northern post two winters ago when Sir Hubert Wilkins was using Aklavik as a base.

Penn. Grade Demand Is Expected to Increase

By J. P. O'DONNELL

OIL CITY, Pa., Dec. 24.—Demand for refined products that will justify a slight increase in runs to stills and an increase of 5 per cent in production of Pennsylvania Grade crude oil is anticipated for next year, according to views expressed by several students of economic trends in the region. These estimates are based on the parallel between actual demand for the principal Pennsylvania products, lubricating oils, and indices of industrial activity and the fact that economists generally are predicting somewhat better business conditions for the whole of 1940 than were experienced through 1939.

The estimates place the 1940 demand for Pennsylvania Grade crude at a minimum of 77,500 bbl. per day, 500 bbl. above the indicated 1939 figure. In order to supply this demand, which is approximately 3,750 bbl. above the actual daily average production in the first 10 months of 1939, it is also estimated that the drilling of 300 wells per month in the Bradford field and 100 wells per month in the Allegany field will be required. Bradford completions this year averaged less than 180 per month, while Allegany completions averaged about 60. Last year these fields produced 67 per cent of the total Pennsylvania Grade crude-oil production of 27,316,000 bbl.

All these estimates are below actual runs, production and drilling in 1937, although actual demand during 1940 is expected to equal and possibly exceed that of the former year. The reason for this is that approximately 1,000,000 bbl. too much crude were run to stills in 1937, that approximately 1,400,000 bbl. too much crude oil was produced, and that completions in Bradford, totaling 4,111, and in Allegany, totaling 880, were excessive. These include water intake wells as well as oil-producing wells, the ratio being about 1 to 1. Data on Bradford and Allegany completions are shown in Table 1.

Runs to stills in 1937 averaged 80,331 bbl. per day. Additions to lubricating-oil inventories in that year indicated excessive runs of approximately 1,000,000 bbl., an average of 3,000 bbl. per day. Since industrial production next year is expected to approximate the 1937 figure, it is concluded therefore the runs to stills in 1940 should duplicate the actual demand for crude in 1937 and, due to the abnormally low lubricating-oil inventories, possibly exceed it by a slight margin.

Predictions of a demand that would justify an increase in production and runs to stills are especially encouraging to the Pennsylvania industry at present because it enters 1940 in the best year-end position in many years. Lubricating-oil inventories are low and prices are the highest in years, crude-oil stocks are dropping, prices have advanced, and a further advance is anticipated. If there are no further changes this year, the average price of Bradford crude for 1939 will be $2.06, 16 cents above the 1938 price, but the lowest otherwise since 1933.

Despite the fact that the rate of Pennsylvania refinery operations in the last 5 months of 1939 is without equal in the "modern" history of the region, production has not been able to keep pace with demand, as indicated by declining stocks. Runs to stills in the last 5 months of this year are averaging close to 83,000 bbl. per day, exceeding even the high rate of operation in any comparable 1937 period. Bright-stock inventories are the lowest on record and neutral inventories the lowest since December 1934. (See Fig. 1.)

While the advent of the war is generally regarded as the principal stimulant in the recent rapid rise of Pennsylvania lubricating-oil prices, a close study of the situation reveals that the beginning of the price rise actually antedated the war and that a very strong factor in that rise was the abnormally low level to which inventories had declined, a decline that had been in progress for 15 months before the war began. However, this rise has been sufficient to draw the attention of the Temporary National Economic Committee.

The committee, instructed by President Roosevelt to watch price movements, includes the following paragraph in its last report: "The price of paraffin wax has risen steadily ever since the declaration of war. It is now sell-

(Continued on Page 359)

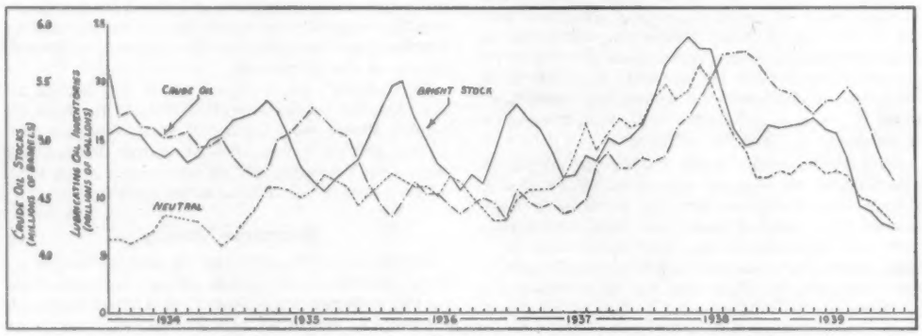

Figure 1

TABLE 1—WELL COMPLETIONS

Month—	Bradford	Allegany
December*	250	95
November	227	92
October	202	88
September	201	66
August	176	78
July	137	71
June	172	69
May	199	50
April	164	33
March	158	21
February	122	21
January	134	21
Total 1939	2,142	705
Total 1938	2,151	393
Total 1937	4,111	880

*Estimated.

Canadian Fields

Completions and Operations in Northwest and in Ontario

By VICTOR LAURISTON

CHATHAM, Ont., Dec. 23.—In North Turner Valley, Royalite Oil Co.'s No. 43, LSD 2, Section 22-20-3w5, has been finished in the upper porous horizon of the Madison limestone at 8,800 ft., after getting the lime at 8,295 ft. It was testing, with indications of a large well. Location is west of the Model wells and southeast of Home Oil Co.'s No. 2 Millarville, the largest producer in the field. It is not likely that drilling will be carried to the lower lime.

Farther north and west, Home Oil Co.'s No. 4, LSD 9, Section 28-18-2w5, got the Madison lime at 7,845 ft., some 450 ft. higher than Royalite's No. 43, and is deepening after cementing casing about 5 ft. in.

In West-Central Turner Valley, Royalite Oil Co.'s No. 45, LSD 14, Section 5-19-2w5, is below 7,147 ft. after getting the limestone at 7,060 ft. In the southwestern extension of the field, Royalite's No. 46, LSD 2, Section 17-18-2w5, is below 7,625 ft., more than 71 ft. in the lime. Farther east, Okalta Oil Co.'s No. 7, LSD 3, Section 16-18-2w5, finished 455 ft. in the Madison at 7,425 ft., tested 332 bbl. a day on 1-in. choke. It was given temporary allowable of 175 bbl.

In the far south, Northwest-Hudson's Bay Co.'s No. 2, LSD 9, Section 8-18-2w5, finished at 7,586 ft. after getting the lime at 7,150 ft., is testing, and looks like a large producer. Farther north, in Section 29-18-2w5, Command Oils' No. 2 LSD 11, got the Madison lime at 7,698 ft. and is deepening below 7,763 ft.

Tests in the Foothills

On the Brazeau structure in the northern foothills west of Edmonton, Home Oil Co.'s No. 1, LSD 16, Section 7-43-17w5, bottoming in the Blairmore at 6,665 ft., has installed high-pressure fittings, and will probably complete with rotary as soon as the outfit from Home No. 3 in North Turner Valley is available.

On the Jumping Pound structure, Brown Consolidated Oils' No. 1, LSD 3, Section 36-24-5w5, has been pulled and plugged, after encountering a fault at 6,410 ft. Some shows of crude in the upper formations were tested, but failed to develop commercial production.

On the Savannah Creek structure, Anglo-Canadian Oil Co.'s No. 1, SW¼ Section 20-14-4w5, has been pulled and plugged after encountering water in the Dalhousie sand at 3,375 ft.

Grease Creek Drilling

On the Grease Creek structure in the northern foothills west of Olds, Grease Creek-Northwest Co.'s No. 1 joint test, LSD 2, Section 13-29-7w5, is in the lower Blairmore formation below 6,100 ft. Madison lime should be reached around 6,500 ft. Three fair gas shows were met above the Blairmore, both oil and gas in the McDougall-Segur and a further show at 5,870 ft. Test is being drilled with a heavy duty rotary outfit.

Steveville Field

In the Steveville field, east of Calgary, Standard Oil of B. C.'s No. 1 Princess, LSD 13, Section 22-20-12w4, is below 3,615 ft., more than 370 ft. in the limestone. A strong gas flow was struck just below the Madison contact and cores taken around 3,300 ft. indicated good oil saturation.

Field Tests Planned

Commencing January 3, 1940, a new series of tests will be made by the Alberta Conservation Board covering all Turner Valley crude producers. Production will be tested through a 1-in. by 12-in. orifice.

Border Fields

In the Taber field, southern Alberta, Border Petroleums' No. 1, LSD 5, Section 32-19-17w4, has fished lost tubing and cemented off water from the upper formations. The well, bottoming at 3,525 ft., will test production in the upper lime, where good oil and gas shows were encountered. Farther south, and somewhat higher on structure, Noble Drilling Co.'s No. 1, LSD 14, Section 33-18-17w4, has cable tool outfit rigged.

East Central Alberta

In the Alberta end of the Lloydminster field, Lloydminster Royalties' No. 1, LSD 4, Section 36-49-1w4, bottoming at 1,921 ft. has overcome trouble with sanding, and is on a steady pumping production. Shaw Petroleums' No. 2, LSD 10, Section 25-49-1w4, is developing considerable gas with the oil, and may turn into a flowing well. In the Saskatchewan end of the field, Shaw Petroleums' No. 3, LSD 5, Section 23-49-28w3, has struck gas in two shallow horizons at 1,390 and 1,400 ft., with flow about 250,000 cu. ft. a day, and is deepening to the main sand at around 1,900 ft. Preliminary work on the refinery to handle the Lloydminster crude has been completed, and equipment from the dismantled Weyburn refinery is on the ground. It is now expected the 750-bbl. plant will be in operation by February.

Ontario Drilling

In the Malahide field, Elgin County, Ontario, Union Gas Co.'s No. 27, Lot 9, Concession 4, Malahide Township, finished at 1,090 ft. with a shot production of 800,000 cu. ft. a day. Union's No. 28, Lot 4, Concession 6, finished a dry hole at 1,160 ft. Union's No. 29, Lot 25, Concession 5, finished at 1,060 ft. with ap-

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LEGAL

IN THE DISTRICT COURT OF OKLAHOMA COUNTY, STATE OF OKLAHOMA

Globe Oil & Refining Company, a corporation, Plaintiff, vs. R. Carl Larkins and George D. Warr, co-partners doing business as Larkins & Warr, et al., Defendants. No. 89,478

NOTICE OF RECEIVERSHIP SALE

TO the Plaintiff, Defendants, and all persons interested in the LUCAS LEASE herein:

By virtue of an order issued out of the District Court of Oklahoma County, Oklahoma, on the 13th day of March, 1936, in the above entitled matter, appointing the undersigned, A. C. Fletcher, Receiver herein, and ordering and directing said Receiver to take posession of certain oil and gas mining leases, together with all the personal property located thereon, or used and obtained in connection therewith, and among which your Receiver was ordered to take possession and charge of, was a lease known and designated as the LUCAS LEASE, and by virtue of an order of sale issued out of the District Court of Oklahoma County, Oklahoma, on the 12th day of December, 1939, with directions to offer for sale and sell to the highest bidder for cash, the said LUCAS LEASEHOLD estate and the personal property and equipment located thereon and used and obtained in connection therewith, insofar as the same are owned and controlled by said Receiver, said leasehold estate being described as follows, to-wit:

A part of the Southwest Quarter (SW ¼) of Section 36 Township 12 North, Range 3 West, lying North of the South line of the M. K. & T. Ry. Co. right-of-way, more particularly described as follows: Beginning at a point 409.6 feet South of the center of Section 36, Township 12 North, Range 3 West, Oklahoma County, Oklahoma; thence bearing South 87 degrees 54 minutes West 2615.5 feet to a point in the West boundary line of the Southwest Quarter (SW¼) of said Section; thence South along said West boundary line 493.75 feet; thence North 86 degrees and 03 minutes East 2621 feet to a point in the East boundary line of said Southwest Quarter (SW¼) of said Section; thence North 0 degrees 08 minutes West along said East boundary line 409.6 feet to a point of beginning, containing 27.105 acres, more or less, subject to railroad right-of-way, in Oklahoma County, Oklahoma.

and the personal property and equipment located thereon and used and obtained in connection therewith, more particularly described as follows, to-wit:

1 122' steel derrick
2 1500 Bbl. Steel bolted tanks
1 O. C. S. Rig Front-Type 95-7
1 Parkersburg Post & Walking beam
1 Weber Gas Engine, 5GNDL 14x14, #186, with muffler
6332' 6⅝" O. D. Casing, cemented in hole,

together with all fittings and connections of whatsoever kind and description used in connection therewith.

The undersigned, as Receiver, will, on the 29th day of December, 1939, at the hour of ten o'clock A. M., at the East door of the County Court House in Oklahoma City, Oklahoma, sell to the highest bidder for cash all of the above described personal property and said leasehold estate. Said bids to be subject to confirmation by the District Court of said County and State, and the Court having the right to refuse and reject any and all bids so submitted.

The said Receiver proposes to sell said leasehold estate without warranty as to said leasehold estate and the buyer shall purchase the same upon the basis of the equipment located upon said leasehold estate.

A. C. FLETCHER,
Receiver.

Prevent THREAD LEAKS

With RECTORSEAL On Every Connection

RECTORSEAL makes a positive leak-proof joint when applied to threaded or gasket connections on oil, gas, gasoline, water or mud lines. Even when threads or gaskets are badly worn, or when subjected to excessive vibration, RECTORSEAL never fails to maintain a perfect seal. It forms a plastic, elastic mass which seals quickly and positively, yet permits easy breakout. RECTORSEAL is insoluble in oils, and unaffected by salt water, dilute acids and by heat up to 400° F.

RECTORSEAL is being widely used for running casing and tubing, on separator and flow line connections, drilling rig connections, setting bolted steel tanks, on gas distribution systems, around natural gasoline plants and refineries, in butane plants and installations, on pipe line systems, and many other profitable applications.

Easily applied by any field worker.

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RECTOR WELL EQUIPMENT CO., INC.
Fort Worth, Texas
EXPORT: Lucey Export Corp., Woolworth Bldg., N.Y.C.

RECTORSEAL
THE POSITIVE LEAK PREVENTER

Illinois Fields

(Continued from Page 338)

5,000 gal., flowed 418 bbl. William Bell's No. 1 Tackett, C N½ SE SE Section 5-2n-6e, dry and abandoned at 3,361 ft.; St. Louis lime top at 3,220 ft.

In Lawrence County Ralph Willis' No. 1 Gwinn, SW cor. NE NW NE Section 18-4n-10w, Buchanan pay at 1,129-35 ft., 1,000,000 cu. ft. of gas.

In Richland County Pure Oil Co.'s No. 2 Wachtel A, C E½ SE SE Section 1-4n-9e, pay at 2,887-94 ft., flowed 965 bbl. through 1-in. choke. Pure's No. 1 Clark, SE SW SW Section 31-5n-10e, pay at 2,825-46 ft., flowed 64 bbl. Pure's No. 4 Coen, C S½ SE NE Section 36-5n-9e, pay at 2,852-75 ft., flowed 696 bbl. through 1-in. choke.

In Edwards County Rodger Lacy's No. 2 Bump, SE SE SW Section 34-2s-14w, shot with 20 qt. in Cypress sand at 2,622-40 ft., pumped 170 bbl. of oil and 100 bbl. of water. L. N. & K. Oil Co.'s No. 1 Broster, NE cor. NW SW SE Section 34-2s-14w, shot with 15 qt. at 2,622-48 ft., pumped 80 bbl.

In Gallatin County Bert Fields and others' No. 5 Green, NE SW SW Section 16-9s-9e, shot with 60 and 80 qt. at 1,769-96 ft., pumped 40 bbl.

In White County Eason Oil Co.'s No. 1 Storms, NE SE SE Section 15-6s-9e, Waltersburg sand at 2,233-63 ft., flowed 335 bbl. I. D. Lain's No. 3 Storms, NE NE SW Section 14-6s-9e, sand at 2,244 ft., total depth 2,281 ft., flowed 225 bbl. Exchange Oil Co.'s No. 4 Storms, NE SW NE Section 14-6s-9e, sand at 2,261-78 ft., flowed 79 bbl. in 4½ hours. Exchange's No. 3 Storms, SE SW NE Section 14-6s-9e, sand at 2,250-70 ft., flowed 96 bbl. in 6 hours. Pure Oil Co.'s No. 1 Martin, C W½ SW NW Section 7-6s-9e, plugged back from 3,130 ft. to 2,371 ft. and casing perforated at 2,351-65 ft., tested water, drilled out to 2,371 ft., pumped 11 bbl. of oil and 11 bbl. of water in 18 hours. Superior Oil Co.'s No. 10 Ford, NE NW NE Section 9-5s-14w, Waltersburg at 2,177-94 ft., pumped 300 bbl. Superior's No. 9 Ford, NW SW NE Section 9-5s-14w, sand at 2,145-79 ft., pumped 300 bbl. Superior's No. 8 Ford, SE SE SW Section 4-5s-14w, sand at 2,143-89 ft., pumped 400 bbl.

In Washington County Shell Oil Co., Inc.'s No. 8 Kozuszek, NE SE NE Section 23-3s-3w, shot with 10 qt. at 1,274-80 ft. and with 10 qt. at 1,258-64 ft., pumped 49 bbl. in 23 hours.

In Wayne County W. R. Curry and others' No. 1 Felix, NW NW SW Section 20-3s-8e, Benoist top at 3,093 ft., Aux Vases top at 3,210 ft., total depth 3,250 ft., pumped 235 bbl. Dunlap's No. 1 Vaughn, NE NE SW Section 34-2s-8e, perforated at 3,362-70 ft., in McClosky lime, acidized with 1,000 and 4,000 gal., pumped 138 bbl. Rockwood and others' No. 1 Young, SE SW NE Section 29-2s-7e, Cypress at 2,972 ft., total depth 3,408 ft., acidized with 500 gal., pumped 42 bbl. with a showing of water. H. H. Weinert, Inc.'s No. 3 McPherson, C E½ NW NE Section 4-2s-7e, perforated at 3,246-54 ft., flowed 800 bbl. naturally.

In Wabash County Phillips Petroleum Co.'s No. 1 Parmenter, SW SW NW Section 7-3s-13w, McClosky lime at 2,869 ft., total depth 2,930 ft., plugged back to 2,502 ft., shot with 10 qt. at 2,493-97 ft., in Cypress sand, pumped 25 bbl. Skelly Oil Co.'s No. 4 Schrodt, NW NE NW Section 29-2s-13w, dry and abandoned at 2,844 ft. Ste. Genevieve lime top at 2,730 ft. Skelly Oil Co.'s No. 2 Schrodt, NE NW NW Section 29-2s-13w, shot with 10 qt. at 2,448-65 ft., pumped 200 bbl. Continental Oil Co.'s No. 3 Gray, NW NW NW Section 29-2s-13w, Cypress sand at 2,457-72 ft., pumped 75 bbl. Continental's No. 1 Cowling, SW NE SW Section 17-2s-13w, Cypress at 2,468-78 ft., pumped 64 bbl. W. Duncan's No. 1, NW NW SW Section 16-2s-13w, shot with 7 qt. at 2,411-21 ft., pumped 29 bbl. Smokey Oil Co.'s No. 1 Woodard, SW SW NE Section 9-2s-13w, Cypress at 2,420-35 ft., shot with 15 qt., pumped 35 bbl.

Among the Outposts

In Shelby County Rex Development Co.'s No. 1 O'Dell, C E½ SE NW Section 20-14n-2e, drilling at 1,892 ft. Turner's No. 1 Hoagland, NW NW SW Section 14-9n-4e, cleaning out on top of fish at 1,672 ft.

In Coles County East Oakland Syndicate's No. 1 W. J. Temple, SW SE NE Section 36-14n-10e, total depth 2,240 ft., pumping for test. Koder's No. 1 Horsley heirs, SE NW NE Section 31-12n-10e, shut down for repairs at 1,150 ft.

In Edgar County H. C. Hawthorne's No. 1 M. E. Hathoway, NW NW SW Section 17-14n-13w, total depth 365 ft., fishing for lost tools after having a show of oil at 285-90 ft.

In Christian County A. Moore and others' No. 1 Meyers, SE SW SE Section 7-13n-1e, shut down at 600 ft.

In Clark County F. E. Harvey and others' No. 1-B Ray Phillips, NW NE NE Section 18-11n-14w, shut down at 320 ft. W. R. Miller's No. 1 E. T. Pinnell, SE NW SE Section 6-11n-14w, total depth 492 ft., and waiting on cable tools. F. D. Strickler's No. 1 McFarland, NW NE SW Section 19-10n-13w, total depth 2,833 ft. and cleaning out to treat a small show of oil.

In Montgomery County Henderson Brothers' No. 1 Joe Ostermeier, NW NW NW Section 30-10n-4w, had a good show of oil at 614-23 ft., bailed 8 bbl. per day with no water showing and was continuing to test. Southern & Petty's No. 1 Sawyer, NE SE NE Section 15-8n-4w, cleaning out to test show of oil at 610-12 ft.

In Fayette County Max Pray's No. 1 Seibert, a Devonian test, NW NW NW Section 10-7n-3e, shut down at 3,262 ft. Max Pray's No. 6 Ferguson, C N½ NW NW Section 18-7n-3e, a Devonian test, total depth 3,246 ft., drilled plug and filled up 2,700 ft. with salt water and was shut down for orders.

In Jersey County A. W. Gerson's No. 1 Knight, NE NW NW Section 32-7n-11w, Devonian 495 ft., St. Peter 1,195 ft., with hole full of water, total depth 1,340 ft.

In Bond County W. N. Lee and others' No. 1 Thomas Sharf, NE SW SE Section 27-7n-4w, shut down at 1,985 ft. Paul Harr's No. 1 F. Thacker, C E½ NE Section 29-7n-4w, drilling at 450 ft. Bond Oil Co.'s No. 1 Albert Wade, SW SE SW Section 16-6n-4w, testing on pump at total depth of 1,856 ft. Central States Oil Co.'s No. 1 M. Oswalt, NW SE SW Section 21-6n-4w, a location. Devonian Oil & Gas Co.'s No. 1 Edwin Ambuehl, NE SW NW Section 22-6n-4w, plugged back to 1,930 ft. from 1,946 ft. and was installing pump. R. E. Jones' No. 1 Huber, NE NW NW Section 28-6n-4w, fishing for drill pipe at 1,450 ft. R. F. Anderson and others' No. 1 J. Morris, NW NW NW Section 16-6n-3w, total depth 1,200 ft., and underreaming casing.

In Effingham County Kingwood Oil Co.'s No. 1 Reichheim, NE NE NE Section 21-6n-6e, plugged back from 2,956 to 2,895 ft., shot with 10 qt. at 2,884-91 ft., cleaned out and bailed ½ bbl. of fluid per hour with a show of oil, treated with 500 gal. of acid and was cleaning out.

In Richland County Pure Oil Co.'s No. 1 M. Heap, C E½ SW NE Section 30-5n-10e, Fredonia 2,820 ft., St. Louis 2,927 ft., good show of oil in Fredonia and some show of oil in the St. Louis and was drilling ahead at 3,061 ft. Pure Oil Co.'s No. 1 F. S. Bartlett, SW NE SE Section 29-5n-10e, the Dundas area, total depth 3,117 ft., acidized with 5,000 gal., swabbed 30 bbl. in 8 hours and was rigging up pump.

In Jasper County efforts to pull the Dundas area over the county line did not appear destined for success when the Mammoth Producing & Refining Co.'s No. 1 Johnoff, C E½ NE SE Section 24-5n-9e, drilled plug at total depth 2,998 ft., recovered water and a small show of oil and was shut down for orders. The No. 2 Johnoff of the same company was still a derrick.

In Madison County Jessie R. Wilson's No. 1 R. F. Danderman, SW SW SW Section 1-5n-6w, rigging up machine.

Marion County

In Marion County Runbar & Wingate's No. 1 France, NE NW SW Section 1-4n-4e, drilling at 2,610 ft. Tex Harvey's No. 6-B Kagy, SE SE SE Section 33-3n-2e, a Devonian test in the Tonti pool, lost circulation at 2,830 ft. and was mixing mud. In the Fairman pool, Misner & Baldwin's No. 1 Parker, SW NW NW Section 17-3n-1e, Benoist 1,442 ft., shot with 1 qt. at 1,442-45 ft. and again with 2 qt., cleaned out, ran tubing, made an estimated 50 bbl. of oil per day with 300 ft. of oil standing in the hole. In the Sandoval field E. F. Jones' No. 1 Kiscala, NE NW SW Section 9-2n-1e, drilling at 2,975 ft. after having small shows of oil at 1,780 ft., 1,930 ft., and 2,020 ft. Baldwin and others' No. 1 Schaffnit, SW SW SE Section 4-4n-1e, shut down for orders at 3,014 ft.

In the Salem field Texas Co.'s No. 19 D. Young, NW SW NW Section 21-2n-2e, a Devonian test, drilling at 2,310 ft. Magnolia Petroleum Corp.'s No. 66 J. H. Young, NW NW SW Section 21-2n-2e, Devonian 3,363 ft., and was drilling plug after running casing. Magnolia Petroleum Co.'s No. 29 D. A. Shanafelt, SW NW NW Section 21-2n-2e, drilling at 2,784 ft. to test Devonian. Lad Oil Co.'s No. 4 Young Church, SW SW NW Section 21-2n-2e, topped Devonian at 3,363 ft., total depth 3,410 ft. and was running 7-in. casing to bottom. Texas Co.'s No. 23 N. Young, SE SE NE Section 20-2n-2e, set 142 ft. of 13-in. casing and was drilling at 2,040 ft. on its way to the Devonian. Same company's No. 22 N. Young, NE SE NE Section 20-2n-2e, another Devonian test, was drilling at 2,505 ft. Same company's No. 21 N. Young, NW SE NE Section 20-2n-2e, drilling at 2,210 ft. Shell Oil Co.'s No. 9-C Salem State Bank, SE NW SE Section 20-2n-2e, show of oil 2,129-33 ft., and another 2,184-99 ft., drill-stem test at 2,190-2,240 ft. recovered no oil or water and was drilling ahead at 2,264 ft. Kingwood-Bell's No. 20 Shanafelt, SE NE NE Section 20-2n-2e, Osage 2,635 ft., drilling 3,123 ft. Same company's No. 19 Shanafelt, SE NW NE Section 20-2n-2e, Devonian 3,328 ft., ran 7-in. casing to 3,353 ft. and was drilling plug at 3,363 ft. Max Pray's No. 5 Cole, SE NW SE Section 16-2n-2e, total depth 3,560 ft. and was running tubing. K. D. Holland's No. 1 Martin, SW SW SW Section 10-2n-2e, set 7-in. casing to 2,475 ft., perforated with 40 shots in the St. Louis lime, filled up 175 ft. with water and small show of oil and was shut down for orders. W. C. McBride, Inc.'s No. 16 N. L. Lee, SE NE SE Section 29-2n-2e, Warsaw 2,472 ft., Osage 2,630 ft. and drilling ahead at 2,989 ft. Magnolia Petroleum Co.'s No. 30 S. Shanafelt, SE NW SE Section 29-2n-2e, lost circulation at 3,155 ft. Haynes & Thomas' No. 2 F. Lee Roadway, NW NE SW Section 28-2n-2e, an old well drilled deeper to 2,639 ft., filled up with 2,400 ft. of water and plugged back to McClosky. W. C. McBride, Inc.'s No. 4 William Fyke heirs, NW SW SE Section 5-1n-2e, St. Louis 2,080 ft., Salem 2,176 ft., pay 2,182-88 ft., total depth 2,244 ft., cleaning out to acidize. Hollingsworth's No. 4 Kalkbrenner, NE SE SW Section 5-1n-2e, Salem lime 2,178 ft., pay 2,185-2,210 ft., acidized with 2,000 gal. acid and was testing.

Hawley Oil Co.'s No. 1 Bryant, C S½ NE NE Section 4-1n-1e, fishing at 3,344 ft., total depth.

Other Areas

In Clinton County, the Fairman pool, W. R. Curry's No. 1 DuComb, SE NW SE Section 13-3n-1w, Glen Dean 1,163 ft., Benoist 1,464 ft., total depth 1,472 ft., drilled plug and was swabbing to clean out. Benoist and others' No. 1 E. Benoist, NE SE NE Section 24-3n-1w, total depth 1,482 ft., and was drilling plug. Elsewhere in Clinton County, M. C. Trumbull and others' No. 1 George Peters, SW SE SE Section 33-2n-4w, shut down at 650 ft. preparatory to running 10-in. casing. Williams and others' No. 1 T. Ellerman, NW SE SW Section 36-2n-1w, had 880 ft. of 8¼-in. casing in the hole and was drilling at 1,023 ft.

Lewis Lilly and others' No. 1 Gum, SW SE NE Section 13-1n-1w, a Devonian test in the Centralia townsite pool, total depth 2,933 ft., perforated with 24 shots 2,901-07 ft., lost perforating gun in hole but recovered it. The well flowed 201 bbl. in 24 hours with a small amount of water through a partly opened casing valve, but died when casing was opened. Operators were preparing to run tubing and treat with 100 gal. of acid. Bell Oil Co.'s No. 1 H. Knolhoff, NE SE SW Section 2-1n-2w, Cypress sand 1,157 ft., show of oil 1,200-05 ft., saturated Benoist 1,324-29 ft., casing 1,324 ft., filled up 900 ft. of fluid after drilling plug and operators were rigging up pump. Paul Mosebach's No. 1 Maddox, a Devonian test in the Bartelso pool, SW SW SW Section 4-1n-3w, was rigging up rotary.

In St. Clair County Harris and others' No. 1 City Park, C NW SE Section 34-2n-9w, drilling at 345 ft.

In Wayne County Pure Oil Co.'s No. 1 J. R. Hubble, C E½ SE SW Section 33-2n-8e, pay streak at 3,059-62 ft., a show of oil at 3,077-79 ft., total depth 3,115 ft., and was cleaning out. Pure Oil Co.'s No. 1 J. A. Gill, SE NE NE Section 25-2n-7e, plugged back to 3,100 ft., reacidized with 3,500 gal. of acid, pumped 19 bbl. of fluid in 24 hours, 90 per cent salt water and was testing. Oilwell Drilling Co.'s No. 1 Hilliard, C N½ NE NW Section 34-1s-7e, McClosky pay 3,295-3,307 ft., running casing to 3,295 ft. John Russel's No. 1 P. J. Philmony, SW NE SW Section 21-1s-6e, drilling 1,210 ft. South State Development Co.'s No. 1 William Grubb, SE SW NW Section 24-2s-8e, testing at 3,434 ft. Anderson's No. 1 E. E. Stewart, C E½ SE NW Section 23-2s-8e, drilling at 2,260 ft. Stocker's No. 1 Mary Creighton, SE SW NW Section 9-2s-8e, drilling 3,425 ft. Texas Co.'s No. 1 F. Koontz, NW SW SE Section 32-2s-7e, drilling 2,740 ft. H. H. Weinert's No. 1 Rumpf, C W½ SW NW Section 10-2s-7e, drilling 3,140 ft. Texas Co.'s No. 1 S. E. Clark, C E½ SE SE Section 4-2s-7e, pay 3,213-15 ft., 3,233-36 ft., and 3,247-50 ft., ran 3,212 ft. of 7-in. casing and was waiting on cement. Ozier and others' No. 1 Accola, NE NE NE Section 31-2s-6e, drilling at 2,800 ft.

In Clay County Pure Oil Co.'s No. 1 Z. Kohlmeyer,

C E½ SE NE Section 13-2n-2e, total depth 3,125 ft., bailed and cleaned out to bottom, tested 2,000 ft. of salt water, plugged back 3,053 ft. to test further. J. B. Barnes' No. 1 W. A. Baker, NW NE NW Section 18-3n-7e, a location.

In Wabash County D. & H. Drilling Co.'s No. 1 Trapp Brothers, SE NE SE Section 31-1n-12w, drilling at 990 ft. Delta Drilling Co.'s No. 1 Doc J. Utter, SE SE NE Section 17-1s-12w, drilling at 780 ft. Chet Evarts' No. 1 Trapp, SE NE NE Section 6-1s-12w, drilled to 2,130 ft., tested water and was shut down for orders. Oliver Petroleum Co.'s No. 1 Nash, SE SE SW Section 9-2s-13w, waiting on cement after running casing to 1,818 ft. Mabee Drilling Co.'s No. 2 Bump, SE SW NW Section 9-2s-13w, Cypress 2,386 ft., with sand at 2,417 ft., running 4½-in. casing to 2,442 ft. Centralia Refining Co.'s No. 1 J. H. Vanault, SE NE SW Section 9-2s-13w, rigging up pump to test. Continental Oil Co.'s No. 1 LaGier, NE NW SE Section 17-2s-13w, drilling at 650 ft. Halstead Oil Co.'s No. 1 A. Gray, NE NW SW Section 29-2s-13w, Cypress sand 2,469-77 ft., ran 7-in. casing to 2,469 ft. and was waiting on standard rig. Zephyr Drilling Co.'s No. 2 Cowling, NE NW SW Section 17-2s-13w, drilling 2,075 ft.

In Edwards County Whisnant and others No. 1 Dunk, NE SE SE Section 36-2s-10e, Waltersburg 2,379-88 ft., Tar Springs 2,433-38 ft. and 2,445-63 ft., McClosky 3,184-87 ft. and 3,207-10 ft.; ran removable casing at 2,380-88 ft. and 2,447-57 ft., and cased to total depth of 3,163 ft.; waiting on cement. Masters' No. 1 Broster, NW NW NE Section 3-3s-14w, Cypress sand 2,612-27 ft., shot with 15 qt. and was rigging up pump.

In Monroe County Hughes Petroleum Corp.'s No. 1 E. Fenaia, NE NE SE Section 15-3s-11w, drilling at 610 ft. Peter's No. 1 Schuster, NW NW SW Section 13-3s-8w, shut down for orders at 1,503 ft. Davis & Brand's No. 1 Charles J. Krause, C S½ NW SW Section 30-3s-7w, drilling at 510 ft.

In Washington County G. B. Warr's No. 1 Dennis, SW NE NE Section 14-3s-3w, drilled plug to total depth 1,231 ft., hole filled with 80 ft. of fluid in 2 hours, bailing oil with some salt water.

In Franklin County Cochrane and others' No. 1 Pyramid Coal Co., NE NW SE Section 35-5s-3w, shut down for orders.

In Lawrence County Walter Payne's No. 1 Monjar, SW NE NW Section 28-4n-11w, drilling at 175 ft. J. W. Cannon and others' No. 1 W. Zaner, SE SE SW Section 10-4n-11w, drilling at 920 ft. W. W. Willis' No. 1 J. 'Prather, C NW SE Section 18-4n-10w, Bridgeport pay 803-26 ft., Buchanan 1,070 ft., gas 1,075 ft., and was pulling upper casing string.

In Jefferson County Wiser Oil Co.'s No. 1 C. Kell, SE NW NE Section 9-1s-1e, the Kell pool, total depth 2,065 ft., and cleaning out to test.

In White County Bishop & Harrington's No. 1 Griffin, SE SE SW Section 28-3s-9e, Benoist 3,216 ft., Aux Vases 3,282 ft., total depth 3,505 ft., ran 5½-in. casing to 3,505 ft. Baldwin and others' No. 1 Danbe, NE SW NE Section 31-3s-8e, total depth 3,390 ft., ran casing to 3,310 ft., rigged up standard tools and was testing. Helmerich & Payne and Eason's No. 1 Hughes, NE NE NW Section 19-4s-14w, drilling at 3,225 ft. Sam Jarvis' No. 1 Spencer, NW NW SW Section 31-4s-11e, pulled in mast and was shut down for orders at 2,056 ft. Exchange Oil Co.'s No. 1 Bramlet, SE SE SW Section 25-4s-10e, St. Louis lime 3,102 ft., total depth 3,140 ft., shut down for orders. Sun Oil Co.'s No. 1 E. H. Greathouse, SW SE NW Section 4-5s-14w, drilling 1,150 ft. J. W. Carter and ot No. 1 O. Johnson, SW NW NE Section 25-6s-8e, epth 2,528 ft. and waiting on standard tools. Heenan & Coe's No. 1 Storms, NW SE NE Section 23-6s-9e, drilling 2,030 ft. Bates & Litchlyter's No. 1 Aud, Cypress saturation 2,749-64 ft., ran 2,749 ft. of 5½-in. casing, drilled out to 2,752 ft., filled up with 2,500 ft. salt water with no oil showing.

In Randolph County Ralston & Beattie's No. 1 J. C. Foster, C NE SE Section 31-4s-5w, shot with 20 qt. at 924-36 ft., cleaned out and had 700 ft. of fluid in the hole. R. T. Pendergast's No. 1 Beattie, SW SW SW Section 11-5s-5w, fishing at 582 ft.

In Hamilton County Robinson's No. 1 R. and W. Porter, SW SE SW Section 17-7s-7e, Fredonia 3,220 ft., porous zones 3,238-57 ft. and 3,278 ft., drilled plug and attempted to acidize with 5,000 gal. Carl Robinson's No. 1 Gholson, NE NE NW Section 16-7s-7e, drilling 750 ft.

In Gallatin County Angle & Angle's No. 1 Duffy, NE NW NW Section 25-8-9e, set 210 ft. of 10-in. casing and was waiting on cement.

PENNSYLVANIA GRADE

(Continued from Page 356)

ing 125 per cent above its price on August 26. Other products of Pennsylvania crude petroleum have also shown increases during this period, although they have been of smaller proportions. Pennsylvania cylinder oil is now 67 per cent and neutral oil 23 per cent above their prewar prices." At the same time the committee states that its report "implies no judgment whatsoever as to the merits of the particular price increases."

That the factor of lower inventories was chiefly the result of more conservative refinery operation is evident from the fact that during 1937-38 period when lubricating-oil stocks advanced to all-time highs, runs to stills averaged 79,000 bbl. per day. In contrast, during the 1938-39 period when these inventories were brought down to normal levels, runs to stills averaged 72,000 bbl. daily.

In the 12 months from May 31, 1937, to June 30, 1938, 188,000,000 gal. of Pennsylvania bright stock and neutral were produced, while in the following year this production was down to 166,500,000 gal., a drop of 11 per cent. Since shipments of these two products totaled about 175,000,000 gal. in both periods, it is apparent that reduced refinery operation was more responsible than any other factor for setting the stage for the vast improvement in the past few months.

The subsequent increase in shipments, coupled with the low inventory position, accounts for the marked increase in prices. Shipments of Pennsylvania lubricating oils did not begin to improve materially until the third quarter of this year, and the increase since has been remarkable. Shipments of bright stocks and neutrals in August, September, and October ran about 12 per cent above shipments during the same 1938 period. The fact that runs to stills continued high and that prices moved upward in November indicates that shipments were maintained in that month.

In view of the low level of lubricating-oil inventories, the declining stocks of crude, the high and apparently well-maintained neutral and bright-stock prices, and the rising crude-oil prices, Pennsylvania operators are looking to 1940 as potentially their best year since 1929. Statistically and pricewise, the industry is in its best year-end position of the decade; and with prospects of a slightly better demand, the optimism is apparently justified.

Gaso Calls Off New Years Party

The Gaso Pump & Burner Manufacturing Co., of Tulsa, is not having its New Years party this year. The large number of pump orders that must be filled make it impossible to shut down at this time. However, during the 1940 Oil Exposition the company will entertain for all its friends with a barbecue buffalo dinner at Shamrock Lodge, Tulsa.

Crude Prices in Representative Oil Fields

Complete crude-price schedules are now being published in the first issue of each month. The last complete schedule was published in the December 7 issue. All changes in crude-oil-price schedules will be published completely in the first issues following the announcement of the changes. Following are representative crude-price schedules in barrels (42 gal.):

East Texas	$1.10
Conroe	1.27
Tepetate, Louisiana	1.03
Smackover, Arkansas, heavy	.73
Illinois basin	1.05
Pecos County, Texas	.78
Lance Creek, Wyoming	.77
Bradford, Pennsylvania	2.50

Gravity Schedules

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

	Signal Hill, California	Oklahoma, Kansas	Gulf Coast Texas
14-14.9	$.80	....	....
15-15.9	.80	....	....
16-16.9	.80	....	....
17-17.9	.80	....	....
18-18.9	.80	....	$0.86
19-19.9	.82	....	.88
20-20.9	.85	$0.70	.90
21-21.9	.88	.72	.92
22-22.9	.92	.74	.94
23-23.9	.95	.76	.96
24-24.9	.99	.78	.98
25-25.9	1.03	.80	1.00
26-26.9	1.06	.82	1.02
27-27.9	1.10	.84	1.04
28-28.9	1.14	.86	1.06
29-29.9	1.17	.88	1.08
30-30.9	1.21	.90	1.10
31-31.9	....	.92	1.12
32-32.9	....	.94	1.14
33-33.9	....	.96	1.16
34-34.9	....	.98	1.18
35-35.9	....	1.00	1.20
36-36.9	....	1.02	1.22
37-37.9	....	1.04	1.24
38-38.9	....	1.06	1.26
39-39.9	....	1.08	1.28
40-40.9	....	1.10	

JOSKY & CO., INC.

HOUSTON, TEXAS, U. S. A.

Cable Address—PETROJOS

"Exporters of Crude and Refined Petroleum Products"

QUESTIONS ON TECHNOLOGY

By Charles K. Francis, Ph. D., Technical Editor

Propane Not Contained in Normal Gasolines in Large Quantities

I would like to know simple laboratory procedures to identify propane in gasolines and determine the percentage.—C. E. B.

There is no simple laboratory procedure by which propane may be separated from gasoline and identified. The ordinary gasolines do not contain propane but there may be a very small quantity found in an exceptionally light gasoline, one that has a very low initial boiling point. The practice is to separate propane from a hydrocarbon mixture by the low-temperature distillation method, the separation being made on the basis of boiling point. When investigating gasoline for volatile hydrocarbon gases, such as propane, it is necessary to heat the liquid under conditions which permit the gas to be collected, this gas is then analyzed in the low-temperature distilling apparatus.

The reason that propane cannot be present in any appreciable quantity in ordinary gasoline is that it is too volatile. Propane boils at 44° below zero F. so will tend to evaporate from any liquid containing it as the temperature rises. Any propane will act to raise the vapor pressure of a gasoline, the vapor pressure of propane being 54 lb. gage at 33° F. and 112 lb. at 70° F. The physical properties of propane may be of interest as shown in the table.

PROPERTIES OF PROPANE

Formula	C_3H_8
Boiling point °F.	—44
Pounds per gal. of liquid at 60° F.	4.24
Heating value of the gas—	
B.t.u./lb.	21,680
B.t.u./gal.	91,900
B.t.u./cu. ft. at 60° and 30 in. mercury	2,572
Specific gravity of gas	1.55
Vapor pressure, lb. gage at —44° F.	0
0	24
33	54
70	112
100	196
130	271
150	346
Volume of air required to burn 1 volume of gas	23.9

Anything more than a trace of propane in a gasoline would tend to produce a vapor pressure which would be in excess of the standards recognized for the several grades of gasoline.

Reference: E. R. Weaver, Propane, Butane, and Related Fuels, Cir. National Bureau of Standards, C420, 1938.

Variables Subject to Control For Efficient Wax Sweating

What are the properties that should be under close control during the sweating operation in the manufacture of paraffin wax?—C. W. T.

A study was made of the factors which influence the proper sweating of wax, by Donnell and Burch, which was reported to the American Petroleum Institute. A brief summary of this paper will serve to answer the question.

The presses and sweat ovens were of the conventional type as operated by the Continental Oil Co. There were three types of slack wax made: (*a*) That from a single pressing yielding high pour-point oil. (*b*) The second from a so-called hot pressing at 35° to 45° F., which was the initial step in a double pressing for making oils having a low pour point. (*c*) The third was a cold slack wax pressed at —5° to 0° F.

The composition of the charging stock influencing the physical properties, chilling temperature, and time cycle are important variables. The slack wax should contain as little oil as possible, for high oil content reduces wax yields by causing too much wax to remain in solution during the formation of the crystals while lowering the temperature. Variations from the normal between oil content and yields of slack wax are related to the source and quality of the wax distillate charged to the presses.

If very high melting-point waxes are present in large quantities they tend to prevent the formation of good crystalline structure, making a poor pressing stock which usually produces a slack wax with high oil content. Proper fractionation of the wax distillate at the stills reduces such waxes. The melting-point range of the slack wax depends on pressing temperatures together with the pressure and rate of flow through the presses.

Undesirable crystalline structure of the wax cake results from faulty chilling. Very rapid chilling causes small crystals while the larger ones are produced when the chilling takes place over a long period. The investigators state that the sweating of hot slack wax was not sensitive to changes in air temperatures, due to the fact that the hot slack wax contained only high melting-point waxes, about 125° F. Cold slack wax showed the effect of warm air all the way through the cake but hot slack wax was affected to the depth of only a few inches. The yield of scale wax increases with the length of the sweating cycle, which cannot be profitably prolonged beyond certain limits. The best length of chilling and sweating cycles may be determined by experimental sweatings of the stock.

Reference: J. W. Donnell and E. A. Burch, Experimental Control of Slack-Wax Sweating, 19th annual meeting, American Petroleum Institute, Chicago, Nov. 17, 1938.

Physical and Chemical Laws and Principles Used in the Petroleum Industry

FARADAY'S LAW

Conductivity and Electrolytes

Bodies which permit electricity to pass through them are: (1) Conductors, such as metals and certain other substances including some forms of carbon, plastics, etc., which transmit the electricity without any chemical change taking place. Conductivity of these decrease with temperature rise. (2) Electrolytes are those substances which transmit electricity only through chemical action and conductivity increases with temperature rise. The effect is to produce ions, which are termed cations, electro positive, separating from the negative electrode, and anions, moving in the opposite direction, separating at the anode.

When equal quantities of electricity pass through different electrolytes, equivalent quantities of these electrolytes are decomposed.

Varnish and Other Deposits in the Automobile Engine

I have noticed that when some gasolines are used in engines which are at low operating speed, but developing much horsepower, there is a tendency for a hard carbon deposit to form on the exhaust and intake manifolds. I would like to know if this can be due to the noncombustibles present in the gasoline? Is there any test which can be performed on the gasoline which would indicate this?—R. R.

The deposition of varnish or resin-like coatings and black deposits insoluble in gasoline, in various parts of the automobile engine, especially on the valves, carburetor mechanism, fuel lines, and manifolds, is considered to be due to "gum," a noncombustible substance present in the gasoline. A poor grade of lubricating oil may contribute to the formation of such deposits.

When gasoline is first finished in the refinery it does not normally contain any appreciable quantity of gum, but it may be formed while the product is in storage. The conditions of storage assist in the rate of formation and quantity produced. Temperature, air admitted, and the presence of catalytic materials have an important part in the action.

The ordinary methods for detecting gum in a gasoline include: (*a*) Evaporation in a copper dish or (*b*) in a glass dish. The first may show a slightly higher percentage due to the catalytic action of thin copper. The gum content is reported in milligrams per 100 ml. of sample. Many gasolines are marketed containing less than 10 mg. Rapid evaporation in a current of heated air is another method, and the action of the product in a bomb with oxygen is also used. These are well-known methods which have been fully described in the literature.

The A.S.T.M. committee on petroleum products has discussed the significance of the gum content of gasoline, and the following extracts are from this source.

Cracked gasoline, upon exposure to oxygen of the air as in ordinary storage, may undergo oxidation with formation of undesirable compounds. Gasolines vary in gum stability, depending upon their nature and upon the refining, so therefore may be expected to form gum at varying rates; that is, show different quantities after a given period of aging. The actual quantity of gum deposited from a gasoline in the engine is a function of operating conditions, engine design, and the percentage of gum present in the gasoline. While the copper-dish test for gum is widely used for determining an index of gumming behavior, it is not supposed to furnish an exact measure of gum content or the stability of a gasoline. Its chief value is to obtain data for comparisons.

It is recognized that certain metals, such as copper, brass, and solder flux accelerate gum formation.

References: Amer. Soc. Testing Materials, Significance of Tests of Petroleum Products. Voorhees and Eisinger, Effect of Gum in Gasoline, Jr. Soc. Auto. Engrs., 24, 584, 1929.

Questions on Petroleum Technology may be sent to Dr. Charles K. Francis, The Oil and Gas Journal, Tulsa, Okla. When a copy of the answer is desired, postage should be included.

Market Record of Active Oil Stocks

Compiled by Carl H. Pforzheimer & Co., 25 Broad Street, New York City, Member New York Stock Exchange and New York Curb Exchange

New York Stock Exchange

1939 High	1939 Low	Week ended Dec. 23 High	Week ended Dec. 23 Low	Week ended Dec. 23 Close	Stocks—	Total shares outstanding	Par value	Latest dividend	Payable or last paid	Dividends paid in 1938	Com. sh. earn. 1938	Com. sh. earn. 1937	1938 High	1938 Low	1937 High	1937 Low
74½	50	56⅛	54¼	54¼	Amerada Corp.	788,675	N.P.	50cQ	10-31-39	$2.00	$2.07	$3.04	78	55	111⅞	51½
24⅞	18⅛	21⅝	20⅝	20¾	Atlantic Refining	2,663,999	$25	25cQ	12-15-39	1.00	1.40	3.51	27⅝	17⅝	37	18
21½	10¼	14⅜	14	14⅜	Barber Asphalt Co.	390,223	$10	25c	11-17-39	....	—.85	1.91	23⅜	12⅛	43⅜	10⅛
19½	11⅛	12⅜	11⅞	12⅛	Barnsdall Oil Co.	2,250,344	$5	15c	12-9-39	1.00	1.26	.85	21⅜	10⅛	35¼	10
9⅞	6½	7¼	7	7⅛	Consolidated Oil Corp.	13,751,846	N.P.	20cQ	2-15-40	.80	.55	1.48	10⅝	7	17⅞	7
31½	19⅞	24⅞	22	23½	Continental Oil of Delaware	4,682,581	$5	25cQ	12-26-39	‖1.00	1.10	2.98	35¾	21¼	49	24
9⅜	4½	6⅛	5⅝	6	Houston Oil (new)	1,098,618	$25		10-17-30		.83	.94	9⅜	5	17⅝	4⅝
20¼	10	12⅝	11⅞	12½	Lion Oil Refining	435,815	N.P.	25cQ	12-23-39	1.00	2.09	2.17	25½	15⅝	34	12½
18	11⅛	16¼	14⅜	16	Mid-Continent Petroleum	1,857,912	$10	35c	12-1-39	.60	.56	2.86	22⅝	12¼	35⅝	14
14⅞	8¾	9½	9	9⅜	Mission Corporation	1,379,245	$10	40c	12-15-39	1.00	1.04	1.31	17¾	10⅜	34	15
15½	5⅝	8⅞	8½	8⅞	National Supply	1,155,517	$10	....	12-22-37	..	—.79	4.90	23	12½	41⅜	17⅝
10½	6	6⅝	6¼	6½	Ohio Oil Co.	6,563,377	N.P.	20c	12-15-38	.20	.25	1.30	14⅞	8⅞	22⅞	8
11⅞	7	7¾	7	7¾	Pacific Western Oil	1,000,000	N.P.	40c	12-19-39	.50	1.22	1.39	15⅞	10¼	29⅝	11⅝
8⅝	5	..	..	..	Pan American Pet. & Trans.	4,702,945	$5	....	12-21-37	...	.08	1.18	9¼	6¼	17⅛	7
46½	31¼	41	38½	40⅝	Phillips Petroleum	4,449,052	N.P.	50cQ	12-1-39	‖2.00	2.03	5.42	44⅜	27¼	64	30½
24	17⅛	20⅞	20⅛	20⅝	Plymouth Oil Co.	1,006,200	$5	35cQ‡	12-31-39	1.40	2.59	2.85	25⅜	15	29⅞	13
11⅜	6½	8⅜	7⅜	8¼	Pure Oil Co.	3,982,031	N.P.	25c	12-20-39	.	.38	2.15	13½	8¼	24⅝	8⅝
10¼	6⅝	8⅛	7⅜	7⅞	Richfield Oil Corp.	4,010,000	N.P.	50c	12-18-39	.50	.51	.35	9⅞	5	6½	4½
24⅜	15½	18⅜	18¼	18⅜	Seaboard Oil of Delaware	1,244,383	N.P.	25cQ	12-15-39	1.00	1.52	1.97	27½	15½	54⅛	16
17¼	9⅞	12⅜	12	12⅜	Shell Union Oil	13,070,625	N.P.	25c	12-20-39	.70	.72	1.44	18⅜	10	34⅜	14⅞
29½	15½	20¼	19⅜	20	Skelly Oil	995,349	$15	25c	12-22-39	1.00	2.27	6.07	34⅜	18½	60⅝	26½
15⅛	10¼	12	11½	12	Socony-Vacuum	31,206,071	$15	25cSA	9-15-39	.50	1.29	1.82	16⅝	10⅜	23¼	13
33⅜	24¼	25¼	24¼	25¼	Standard Oil of California	13,004,153	N.P.	25cQ	12-15-39	1.40	2.22	3.17	34⅞	25½	50	27½
30	22⅜	26½	25¼	25⅝	Standard Oil (Indiana)	15,272,020	$25	50c†	12-15-39	1.00	1.82	3.66	35½	24⅝	50	26½
53½	38	44¾	42⅝	44⅝	Standard Oil of New Jersey	26,618,065	$25	75c¶	12-15-39	§1.50	2.86	5.64	58⅜	39¾	76	42
66	45⅜	57¼	56½	57	Sun Oil	2,316,484	N.P.	25cQ	12-15-39	1.00	1.07	3.86	65⅛	45	77½	44½
3⅝	1⅜	2¼	2⅛	2⅛	Superior Oil Corp.	1,388,979	$1	10c	12-28-38	.10	.24	.32	4¼	1⅜	7⅜	1½
50¾	32½	44¼	42½	44	Texas Corp.	10,876,882	$25	50cQ	1-2-40	2.00	2.13	5.02	49⅝	32⅝	65⅛	34⅝
5⅝	3¼	4	3½	3¾	Texas Gulf Producing Co.	888,144	N.P.	10c	12-15-39	.15	.86	.68	5⅞	2⅝	9⅝	2
11⅜	7	8½	8⅛	8½	Texas Pacific Coal & Oil	888,236	$10	10c	12-1-39	.40	1.16	1.11	12½	7	16⅝	5⅝
14¼	9½	10⅝	10	10⅛	Tide Water Associated	6,375,253	$10	15c	12-1-39	1.00	1.28	2.08	15⅜	10⅛	21⅝	13⅛
19¾	15⅛	16	15⅝	15⅜	Union Oil of California	4,666,270	$25	25c	11-10-39	1.20	1.47	2.58	22½	17⅛	28⅛	17½
24⅛	20⅛	23	22⅛	22½	Union Tank Car Co.	1,177,381	N.P.	40c†	12-1-39	1.30	1.16	1.70	23½	20	31½	22
4¼	2⅜	3¼	3⅛	3¼	Wilcox Oil & Gas	487,568	$5		5-10-28		.52	.24	3½	1⅝	6¼	1⅝

†Includes extras. ‡Also 2 per cent in stock. §Also 1½ per cent stock dividend. ‖Also right to subscribe to bonds. ¶Also 1½ per cent in stock. —Deficit.

New York Curb Exchange

1939 High	1939 Low	Week ended Dec. 23 High	Week ended Dec. 23 Low	Week ended Dec. 23 Close	Stocks—	Total shares outstanding	Par value	Latest dividend	Payable or last paid	Dividends paid in 1938	Com. sh. earn. 1938	Com. sh. earn. 1937	1938 High	1938 Low	1937 High	1937 Low
11⅝	5½	7⅝	6	7⅝	American Republics Corp.	1,308,049	$10	10c	7-11-38	$0.10	—$0.22	$0.27	11⅜	5	10	6⅝
7¼	2½	2⅞	2½	2⅞	Bridgeport Machine Co.	270,000	N.P.	$1.25	12-30-37	....	—.14	1.90	10¼	4⅞	21⅝	7
34⅝	26½	30	28	28	Buckeye Pipe Line Co.	200,000	$50	$1	12-15-39	2.00	2.36	4.02	39	22½	51½	36
130	109½	109⅝	109½	109½	Chesebrough Mfg. Co.	120,000	$25	$1.50Q†	12-18-39	6.50	5.32	6.73	128	97	112	95½
9¼	4¼	5¼	4⅝	5	Cities Service (new)	3,704,067	$10	....	6-1-32		.23	1.02	11	5⅛	5⅜	1½
2¼	2	1⅝	1½	1½	Cosden Petroleum	462,551	$1	....				.19	2⅜	⅞	5½	1½
28	16¾	22⅞	22⅜	22⅝	Creole Petroleum	6,975,383	$5	50cSA†	12-15-39	1.00	1.64	1.61	27½	17½	38⅜	20¼
7⅛	3⅝	4½	4	4½	Darby Petroleum	351,390	$5	25cSA	1-15-39	.50	....	1.36	10¼	5½	18⅝	6½
2⅝	1½	1⅞	1⅞	1⅞	Derby Oil & Refining	263,162	N.P.				—.91	1.34	3½	1½	8⅝	2¼
23	15⅛	23	23	23	Eureka Pipe Line	50,000	$50	50c	11-1-39	3.00	—.37	—.12	31	16	47½	24½
45⅛	29¼	39¼	38	39	Gulf Oil Corp.	9,076,202	$25	25cQ	12-15-39	1.00	1.43	3.51	46⅞	33	63½	33
71	52½	64	61¼	63¼	Humble Oil & Refining	8,987,840	N.P.	62½c	12-16-39	3.00	3.98	5.22	72⅝	56	87	54⅞
17	11⅜	12⅛	11½	11⅞	Imperial Oil of Canada	26,965,078	N.P.	37½c†	12-1-39	1.25	.96	.98	19½	14⅛	24¼	14½
7¼	5½	6	5⅝	5⅝	Indiana Pipe Line	300,000	$10	20c	11-15-39	.50	.47	1.03	9⅜	6	15	5⅞
27½	17⅜	17⅞	17⅜	17⅝	International Petroleum	14,324,088	N.P.	75c	12-1-39	2.50	1.98	....	31¼	21	39½	23½
3⅜	2⅛	2½	2⅛	2¼	Kirby Petroleum Co.	500,000	$1	10c	4-15-38	.10	.14	.17	5	2⅛	8⅜	2⅝
10½	7⅛	10¼	10	10	Lone Star Gas	5,553,747	N.P.	30c	12-22-39	.60	.88	1.14	10⅜	6⅝	14¼	5¼
7⅜	4	5⅝	5	5⅝	Louisiana Land & Exp.	2,977,449	$1	5c	12-15-39	.45	.45	.58	9⅜	6½	15¼	6⅝
17	14½	..	..	..	Margay Oil Corp.	149,943	N.P.	25cQ	1-10-40	1.00	2.28	3.26	24	16	33½	17
8⅜	6⅝	7⅜	7	7¼	Midwest Oil Co.	998,474	$10	45c	12-15-39	1.00	.93	1.14	9⅜	6⅝	14⅝	6¼
6	4⅞	5¼	5¼	5¼	Mountain Producers	1,593,584	$10	30cSA	12-15-39	.60	.62	.76	5⅝	4½	7⅞	4⅛
14	11¼	12⅜	12	12⅛	National Fuel Gas	3,810,183	N.P.	25cQ	1-15-40	1.00	.84	.96	14⅝	11½	19½	12
9¼	7¼	8⅞	8½	8⅞	National Transit	509,000	$12.50	50c	12-15-39	.75	.88	1.19	9¼	6½	12½	7¼
1⅝	1	1	1	1	New Mexico and Arizona	1,000,000	$1	1c	12-1-37		.02	.02	2⅝	1½	5	1⅛
5	4	5½	5½	5½	New York Transit	100,000	$5	25c	10-14-39	.25	.16	.49	4½	3½	5⅜	3⅝
6	4½	6	5⅞	6	Northern Pipe Line	120,000	$10	15c	12-1-39	.35	.24	.78	6	4	12⅜	5⅜
7⅝	4	4⅜	4½	4⅝	Pantepec Oil	2,857,000	$1	....					7⅜	3½	9⅝	2⅜
5	1¼	3	2⅞	3	Root Petroleum Co.	336,045	$1	25c	2-1-37	...	.17	—.17	4½	1⅝	12⅜	2
3	1⅞	2½	2½	2½	Ryan Consolidated	298,931	N.P.				.29	.46	4	2⅛	6½	2¼
4⅞	3½	..	..	..	Southern Pipe Line	100,000	$10	15cSA	9-1-39	.30	—.27	.85	5⅜	3¼	7¼	3⅜
40½	26¾	38	37⅜	37½	South Penn Oil	1,000,000	$25	$1.87½Q†	12-15-39	1.75	1.44	4.64	39	28¾	56	35
23	17	..	..	..	Southwest Penna. Pipe Lines	35,000	$50	50cQ	10-2-39	2.00	—.41	.95	22¼	16½	42	20
19½	17¼	18¾	18⅜	18½	Standard Oil of Kentucky	2,604,790	$10	55c†	12-15-39	1.25	1.45	1.60	18¾	15	21⅛	14¾
28⅛	17	28¼	27¼	28¼	Standard Oil of Ohio	753,740	$25	75c†	12-15-39	1.00	1.81	3.67	22¾	16¼	45	16
2⅜	1⅜	1⅞	1⅜	1⅜	Sunray Oil	2,007,076	$1	5c	12-20-39	.05	.23	.42	3¼	2	4⅞	2
4	2⅜	2⅜	2⅜	2⅜	Texon Oil & Land	936,024	$2	10c	6-30-39	.60	.56	.51	5¼	3½	7⅝	2
6	2½	4	3½	3½	Transwestern Oil Co.	750,000	$10				—.12	.48	7⅝	4¼	13⅞	4⅝
3⅜	1⅝	1⅜	1⅝	1⅜	United Gas Corp.	7,818,959	$1				—.51	.25	5¼	2⅝	13⅞	3

†Includes extras. ‡Payable in Canadian funds. —Deficit.

Personal Paragraphs

S. S. SMITH, general superintendent of pipe lines for the Shell Oil Co., Inc., with offices in St. Louis, Mo., is spending several days at the company's various Oklahoma and North Texas pipeline properties.

J. R. TOMLINSON of the Layne-New York Co., has returned to the United States after a 3-year period for his company in England. Prior to this he was located in Paris, France, for the company. His foreign experience has also included three years of service in Venezuela, S. A., for Gulf Oil Corp. Mr. Tomlinson plans to spend three months in this country, and at present is visiting the fields of the Mid-Continent area.

R. W. HARLESS, scout with Magnolia Petroleum Co., Shreveport, La., is spending his vacation at his home in Gonzales, Tex.

STANLEY HOYMAN, independent producer, Tyler, Tex., is moving a rig to Oil City, La., to develop shallow production.

C. SYDNEY FREDERICK, secretary to the Department of Conservation at New Orleans, La., has resigned to run for state senator.

ISH McKNIGHT, JR., scout for Mid-Continent Petroleum Corp., Midland, Tex., left last week for Tulsa after being advised of the death of his father in an accident.

ALBERT CRARY, JAMES CRARY, WILLIAM MORRISON, GLEEN BRATCHER, LINCOLN STULL, ERNEST MARTI, and REED McCARTNEY have left Houston, Tex., for Colombia, South America, where they will be engaged in geophysical exploration by the Independent Exploration Co.

NEIL C. NEEDHAM, of General Petroleum Corp., has been elected chairman of the wildcat committee of the California Oil and Gas Association which this year at the annual Christmas jinx presented the Wizard of Ooze, an original play by the wildcats which satirized individuals and operations of the California oil industry. Other wildcat officers for 1940 are W. D. RUSSELL, Republic Supply Co., vice chairman; JOSEPH JENSEN, Tide Water Associated Oil Co., treasurer, and D. S. KILGOUR, California Oil and Gas Association, secretary.

S. A. DELLAPLAIN has tendered his resignation as vice president and general manager and member of the board of directors of Southland Royalty Co. R. H. CUMMINS, of Fort Worth, Tex., vice president, was elected to take Mr. Dellaplain's place on the board.

W. W. CLAWSON, assistant chief geologist for Magnolia Petroleum Co., Dallas, Tex., has been named president of the Dallas Petroleum Geologists. Other officers were: L. W. MacNAUGHTON, of McNaughton & De Golyer, vice president; D. M. COLLINGSWOOD, Sun Oil Co., secretary-treasurer. JOHN M. CLAYTON, geologist for Seaboard Oil Co., Dallas, was the chief speaker.

SHIFTS: P. T. MARTIN, superintendent, Texas Co., from Fellows, Calif., to Long Beach, Calif.; J. S. WALDON, engineer, Standard Oil Development Co., from Iowa City, Iowa, to Elizabeth, N. J.; GEORGE E. TAYLOR, geologist, Continental Oil Co., from Lyons, Kans., to Centralia, Ill.; C. F. MARTENS, manager, Wyoming Gas & Oil Co., from Osage, Wyo., to Newcastle, Wyo.; FRANK E. GRIFFIN, Standard Oil Co. of N. J., from Somerset, Mass., to Aruba, N. W. I.; GEORGE E. BELL, superintendent, Smith Petroleum Co., from Bay City, Mich., to Grand Rapids, Mich.; E. C. BOLTON, manager, Ohio Oil Co., from Los Angeles, Calif., to El Segundo, Calif.; E. P. ADAMS, secretary and treasurer, Western Gulf Petroleum Corp., from Houston, Tex., to Corpus Christi, Tex.; BARNEY G. DICKSON, Engineers Limited, from Kilgore, Tex., to Los Angeles, Calif., C. H. SHERMAN, superintendent, Union Oil Co. of California, from Victoria, Tex., to Fort Collins, Colo.; F. A. COURTNEY, engineer, Fohs Oil Co., from Houma, La., to Jackson, Miss.; EDWARD J. FOLEY, from Denison, Tex., to Standard Oil Co. of Egypt, Cairo, Egypt; J. R. MUNCE, vice president, Arkansas Natural Gas Corp., from Pittsburgh, Pa., to Sarasota, Fla.; JOHN LAPHAM, manager, Minnesota Power & Light Co., from Duluth, Minn., to Chanute, Kans.; S. F. SHAW, engineer, Westgate Oil Co., from Oklahoma City, Okla., to San Antonio, Tex.; OSVALDO BRACACINNI, Continental Oil Co., from Ponca City, Okla., to Buenos Aires, Argentina, S. A.

Do You Remember?

From The Oil and Gas Journal Files

25 YEARS AGO

The total production of Union Oil Co.'s No. 2 Lakeview, in California, which stopped flowing in October, is officially given as more than 7,000,000 bbl. A feature of the well has been that it flowed more after the sun set than during the day time, and that it flowed most when the moon was full.

C. W. Archbold, 72, prominent in the early days of the Pennsylvania oil fields, died in Kingston, N. Y., December 24. He was a brother of John D. Archbold of Standard Oil Co. His last activity was with the Standard's Camden Oil Works, at Parkersburg, W. Va.

20 YEARS AGO

A 400-bbl. well is completed in Harmar Township, Allegheny County, Pennsylvania, producing from the Fifth sand.

S. W. Forrester, Wichita, Kans., oil man, buys Charles P. Taft's Catarina ranch in Dimmitt County, Texas, for $1,000,000.

Mrs. Lewis E. Mallory, wife and sister of prominent oil and gas men, dies at her home in Bradford, Pa.

Minnehoma Oil Co. brings in a 20,000-bbl. initial producer in Osage County, Oklahoma. The Indian Agency ordered it shut in and when opened it would not produce.

10 YEARS AGO

Seventy-two oil companies, firms and individuals produced 88.85 per cent of all the 221,814,834 bbl. of oil produced in Texas in the first 9 months of 1929. Gulf Production Co. was the largest single producer.

American Bar Association appoints a committee of nine members to study the legal problems attending the conservation of oil resources.

J. Edgar Pew, vice president of the Sun Oil Co., will move his headquarters from Dallas to Philadelphia on January 1.

K. M. REGAN, vice president, Salt Dome Oil Corp., Houston, Tex., is recovering from an operation.

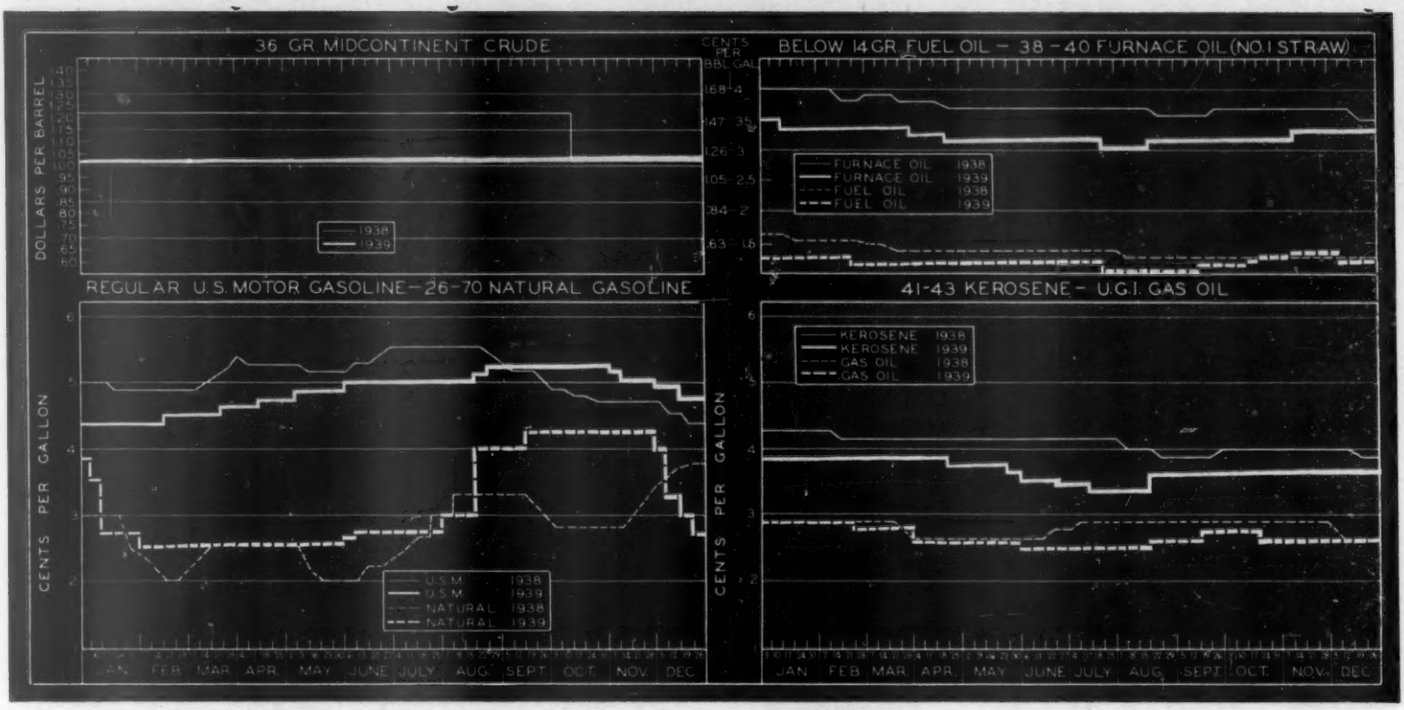
SCOTT HEYWOOD, independent producer of Jennings, La., and early organizer of the Independent Petroleum Association, is very seriously ill at his home in Jennings.

M. R. CHURCH, assistant superintendent of gas and gasoline department, Shell Oil Co., Inc., Houston, Tex., is making a 10-day Christmas holiday motor trip with his family.

J. L. HARPER, geologist of Hillsboro, Ohio, who has been conducting a geophysical survey for the past 2 months in the provinces of Saskatchewan and Alberta, Canada, has returned to Cincinnati, Ohio.

DR. WILLIAM LLOYD EVANS, chairman of the chemistry department of Ohio State University, has been elected president of the American Chemical Society for 1941. Among the councilors elected was DR. P. K. FROLICH.

HARRY C. WIESS, president of Humble Oil & Refining Co., has been appointed by former President Herbert Hoover as chairman of the Houston, Tex., committee on Finnish relief. Other oil men to serve on the committee will be W. B. PYRON, vice president, Gulf Oil Corp.; J. S. LEACH, vice president, Texas Co.; T. E. SWIGART, vice president, Shell Oil Co., Inc.; T. J. DONOGHUE, retired vice president, Texas Co.; H. R. CULLEN, president, Quintana Petroleum Co.; HARRY HANSZEN, independent, and GEORGE W. STRAKE, president, Strake Petroleum, Inc.



Representative Mid-Continent Quotations on Crude Oil and Refined Products, Basis Oklahoma (Group 3)

Rise of Heavy Fuels in North Atlantic Area Relieves Dull Refinery Market

By T. F. SMILEY

SHARPLY ascending prices of heavy fuel oil at North Atlantic ports, with increased firmness of light burning oils in New York and New England, relieved dullness that overspread the country's refinery markets in the closing week of the year.

The advance in heavy fuels carried the New York price for Bunker C to $1.50. The rise was not unexpected, but some were surprised by its extent. Stocks are said to be tightly held. Refiners who normally sell at the low of the market range are short on supplies, and this may work to maintain the advance.

Marine diesel oil also was advanced to a new price of $2.10 per barrel in New York. Kerosene and Nos. 2, 3, and 4 fuel oils were advanced in the Northeast ¼ to ⅝ cent per gallon.

Standard Oil Co. of New Jersey explained that the tanker charter market is largely responsible for the increases. Tank steamer rates have reached 60 cents per barrel, compared with approximately 20 cents, for movement from the Gulf to North Atlantic ports before the war started in September.

Light heating oils in New York and New England have been advanced an average of four-tenths of a cent per gallon during the past 2 weeks by practically all marketers. Seasonal improvements in consumption, comparatively low stocks, and high tanker rates combined to give the light heating oil market its stimulant.

The northeastern gasoline market is slightly stronger. The 65-octane and above is quoted generally in New York at 6¾ to 7¼ cents per gallon, but rumors are current that business can be done at 6⅛ cents.

Unbroken flatness prevailed in the Group 3 area. Nobody wanted to add anything to year-end inventories that was not absolutely necessary. At the same time sales managers said they had orders for material that was not to be delivered till after the turn of the year. So the closing days of 1939 and the first week of 1940 should witness substantial movement of refinery products.

Natural gasoline, which began a precipitate drop early this month, was still in a bad way, with prices headed for lower levels.

The market reports for Group 3 and the East Coast are consolidated this week. Separate reports will appear as usual in the issue of January 4. Owing to the Christmas holiday some oil statistics usually published are not available.

Refined Oil Market Barometer

MID-CONTINENT. Gasoline weak. Naturals falling. Bright stocks up. Heating oils firm.

EAST COAST. Heavy fuels sharply higher. Light fuels firmer. Gasoline steadier.

GULF COAST. Gasoline inactive, with unwieldy stocks growing. Other products firm.

PENNSYLVANIA. Gasoline soft. Bright stocks and neutrals higher.

CALIFORNIA. Market quiet. Gasoline, kerosene, and diesel tending to weakness.

CHICAGO. Gasoline dull, with prices barely holding. Furnace oils show improvement.

Modest improvement in the refinery gasoline market was reported. There were said to be fewer stocks in urgent need of buyers and increasing refusals to give concessions. Stormy weather in northern regions was curtailing consumption.

Heating oils were exhibiting a little more firmness, with range oil, No. 1 prime white, and No. 2 straw leading. Snow and cold winds, which interfered with motor travel, were quickening demand for furnace oils, and belief was expressed that from now on this division would be active.

Lubricating oils, unyieldingly tight for months, seem to have even better days ahead. Bright stocks advanced a cent. Branded motor oils are expected to advance 4 to 6 cents with the opening of the new year. Refiners said they were well sold up on wax and that pleas for rush shipments were coming in.

The Gulf Coast gasoline market continued to mark time and there were no important developments affecting other products, all of which remained firm. Additional piling up of gasoline stocks at Gulf Coast refineries was reported, but except for reductions by several sellers of their high quotations to conform with the generally quoted market there was no change.

Western Pennsylvania refiners dropped their tank-car gasoline prices by an eighth to a quarter of a cent. Production of gasoline in that district has been in excess of requirements for several weeks owing to the pressure on refiners to supply lubricating oils. Offsetting in part the declining gasoline market, western Pennsylvania refiners in position to quote at all have raised prices on neutrals, bright stocks, and dark cylinder oils.

Retail Oil Markets

Tank-wagon and filling station prices on gasoline and kerosene furnished by the larger marketing firms

Prices as of December 26, 1939

Taxes

The gasoline quotations given in the following tables include the 1-cent federal tax, as well as state, county, and city taxes. The gasoline is the regular or standard grade. In most areas lower grades and a premium grade also are available.

Standard Oil Co. (Indiana)

	Gasoline: Tank wag.	Dlr.	Inc. tax	Kero. tank wag.
Chicago, Ill.	15.1	13.1	4.0	10.0
Decatur	15.1	12.1	4.0	8.5
Joliet	15.1	13.6	4.0	10.0
Peoria	15.1	12.7	4.0	10.0
Quincy	14.9	13.4	4.0	9.8
Davenport, Ia.	15.1	13.6	4.0	†10.0
Des Moines	14.9	13.4	4.0	†9.8
Mason City	15.3	13.8	4.0	†10.2
Duluth, Minn.	16.9	15.4	5.0	10.8
Mankato	16.5	15.0	5.0	9.9
Minneapolis	16.5	15.0	5.0	10.4
LaCrosse, Wis.	16.5	15.0	5.0	10.4
Green Bay	16.9	15.4	5.0	10.0
Milwaukee	16.3	14.8	5.0	10.2
Detroit, Mich.	13.6	12.1	4.0	7.6
Grand Rapids	13.9	12.4	4.0	9.7
Saginaw	14.8	13.3	4.0	9.3
Evansville, Ind.	16.6	15.1	5.0	†10.5
Indianapolis	16.8	14.3	5.0	†10.0
South Bend	16.8	15.3	5.0	†10.0
Fargo, N. D.	17.7	16.2	5.0	11.6
Huron, S. D.	17.0	15.5	5.0	10.9
Kans. City, Mo.*	14.4	12.9	4.0	8.0
St. Louis*	14.7	13.2	4.0	8.0
St. Joseph	14.4	12.9	4.0	7.9
Wichita, Kans.	13.3	11.1	4.0	7.9

*State tax 2 cents, 1-cent city tax and 1-cent federal tax. †Does not include 4-cent state tax. ‡Does not include 3-cent state tax.

Exclusive of state general sales taxes.

Discounts to commercial consumers: On purchases per month off tank-wagon prices: 1,000 gal. or more, 1.5 cents off; minimum delivery 25 gal.

Stanolex Fuel Oil in Chicago

Effective December 12, 1939, f.o.b. Chicago tank-wagon prices: Standard heater oil, 1-99 gal., 9 cents; 100-149 gal., 8 cents; 150 gal. and over, 7.5 cents. Stanolex fuel oil No. 1, 1-149 gal., 8.25 cents; 150-399 gal., 7.25 cents; 400 gal. and over, 6.75 cents. Stanolex furnace oil, 1-149 gal., 8.25 cents; 150-399 gal., 7.25 cents; 400 gal. and over, 6.75 cents. Stanolex Grade A, 1-399 gal., 5.5 cents; 400 gal. and over, 4.5 cents. Stanolex Grade B, 1-799 gal., 5.25 cents; 800 gal. and over, 4.25 cents. Stanolex Grade C, 1-999 gal., 4.5 cents; 1,000 gal. and over, 3.5 cents.

Ohio

STANDARD OIL CO. OF OHIO

	Gasoline: Tank-wag. cons'r.	Dlvided dlr.	Inc. tax	Kero. tank wag.
Ohio points	16.0	15.0	5.0	*13.0

*Includes state tax of 1 cent.

Atlantic Coast District

STANDARD OIL CO. OF NEW JERSEY

	Gasoline: Cons'r. tank car	Dlr. tank wag.	Inc. tax	Kero. tank wag.
Atl'tic City, N. J.	11.6	12.7	4.0	8.1
Newark	11.6	12.7	4.0	8.1
Annapolis, Md.	13.35	14.35	5.0	9.5
Baltimore	12.75	13.75	5.0	7.5
Cumberland	14.15	16.15	5.0	10.0
Wash'gton, D. C.	11.00	12.0	3.0	9.5
Danville, Va.	14.95	17.45	6.0	12.9
Norfolk	13.75	16.25	6.0	11.0
Petersburg	14.05	16.55	6.0	11.7
Richmond	14.05	16.55	6.0	10.7
Roanoke	15.25	17.75	6.0	11.0
Charles'n, W. Va.	14.55	17.05	6.0	12.6
Parkersburg	13.85	15.35	6.0	11.2
Wheeling	14.85	16.75	6.0	12.2
Charlotte, N. C.	16.90	18.40	7.0	11.8
Hickory	17.45	18.95	7.0	12.3
Mt. Airy	17.30	18.80	7.0	12.2
Raleigh	16.85	18.15	7.0	11.5
Salisbury	16.95	18.45	7.0	11.9
Charleston, S. C.	14.75	17.25	7.0	10.6
Columbia	15.60	18.10	7.0	11.5
Spartanburg	16.30	18.80	7.0	12.2

Price basis to Essolene undivided dealers: Dealer tank-wagon price less 0.5 cent per gallon. Price basis to commercial consumers, effective March 8, 1937, in Maryland, District of Columbia, and in Arlington and Fairfax counties in Virginia; and March 12 in New Jersey: To contract accounts purchasing at least one full compartment at time by hose connection, on yearly purchases: From 2,500 to 100,000 gal., consumer tank-wagon price at time and place of delivery; 100,000 gal. per year, consumer tank-car price plus .5 cent per gallon. Consumer tank-wagon price generally will be equivalent to dealer tank-wagon price less .5 cent per gallon.

Effective January 16, 1939, in North Carolina the commercial consumer schedule became as follows: Single deliveries of 50 gal. or more, consumer tank-wagon price. Single deliveries of less than 50 gal., 4 cents per gallon over consumer tank-wagon price. Generally the posted consumer tank-wagon price will be equivalent to the dealer price, less .5 cent per gallon. The above policy also applies in South Carolina effective January 23, 1939.

Discounts for kerosene, 1 cent off tank-wagon price for 25 gal. or more under contract (contract not necessary in Baltimore) except no discount in New Jersey.

Southern District

STANDARD OIL CO. (KENTUCKY)

	Gasoline: Cons'r. tank wag.	Net dlr.	Inc. tax	Kero. tank wag.
Atlanta, Ga.	21.0	18.0	7.0	9.0
Augusta	20.5	17.5	7.0	10.0
Macon	21.0	18.0	7.0	10.5
Savannah	19.5	16.5	7.0	9.0
Birmingham, Ala.	21.5	18.5	8.0	9.0
Mobile	21.5	18.5	9.0	8.0
Montgomery	22.5	19.5	9.0	11.0
Jackson, Miss.	19.5	16.5	7.0	10.0
Vicksburg	19.5	16.5	7.0	9.5
Jacksonville, Fla.	19.0	16.0	8.0	8.0
Miami	20.0	17.0	8.0	7.0
Pensacola	21.5	18.5	9.0	8.5
Tampa	21.0	18.0	8.0	8.5
Lexington, Ky.	19.5	16.5	6.0	10.0
Covington	18.0	15.0	6.0	9.5
Louisville	18.5	15.5	6.0	9.0
Paducah	18.5	15.5	6.0	9.0

Price basis to tank-wagon consumers: Effective January 4, 1937; 3 cents per gallon below tank-wagon price.

Montgomery, Ala., has a county tax of 1 cent per gallon, and a city tax of 1 cent per gallon on gasoline, in addition to state tax and 1 cent per gallon on kerosene. Mobile, Ala., has a city gasoline tax of 2 cents per gallon; Birmingham, Ala., has a city gasoline tax of 1 cent per gallon; Pensacola, Fla., has a city gasoline tax of 1 cent. All are included in the table.

Pennsylvania and Delaware

ATLANTIC REFINING CO.

	Gasoline: Cons'r. tank car	Dlr. tank wag.	Inc. tax	Kero. tank wag.
Philadelphia, Pa.	13.0	14.0	5.0	10.0
Pittsburgh	13.0	14.5	5.0	10.5
Allentown	13.0	14.5	5.0	10.5
Erie	13.0	14.5	5.0	10.0
Scranton*	13.5	15.0	5.0	10.5
Altoona	13.0	15.0	5.0	10.5
Dover, Del		14.5	5.0	10.5
Wilmington		14.0	5.0	9.75

Price basis to undivided dealers, dealer tank-wagon price less .5 cent per gallon.

*Voluntary discount of 1 cent allowed to dealers only.

Discount on kerosene, 2 cents per gallon off tank-wagon price on tank-wagon deliveries of 25 gal. or more at one time.

Pacific Coast Territory

STANDARD OIL CO. OF CALIFORNIA

	Gasoline: Tank truck	Serv. sta.	Inc. tax	Kero. tank wag.
San Francisco	17.5	18.5	4.0	11.5
Los Angeles	17.0	18.0	4.0	10.0
Fresno, Calif.	18.5	19.5	4.0	12.5
Phoenix, Ariz.	20.0	21.0	6.0	*17.5
Reno, Nev.	20.5	21.5	5.0	13.5
Portland, Ore.	20.0	21.0	6.0	13.5
Seattle, Wash.	20.0	21.0	6.0	†13.75
Spokane	21.5	22.5	6.0	†16.75
Tacoma	20.0	21.0	6.0	†13.75

*Includes 5-cent state tax. †Includes 0.25-cent state tax.

Discounts to dealers: On gasoline, off tank-wagon price, to 100 per cent dealers, 3 cents. To commercial consumers: On tank-wagon price; on single deliveries of 40 gal. and over, advance quantity discount extended at time of delivery, 3 cents. Service-station schedule applies on single deliveries less than 40 gal. On kerosene in tank-car, transport-truck and trailer delivery, 3 cents off tank-wagon price; plant deliveries to jobbers, 2.5 cents below tank wagon.

March 18, 1939, split dealer discount was canceled.

New York and New England

SOCONY-VACUUM OIL CO., INC.

	Gasoline: Cons'r. tank car	Dlr. tank wag.	Inc. tax	Kero. tank wag.
Albany	12.6	14.2	5.0	7.80
*Met. N. Y.: Manhat., Bronx Queens, Br'klyn Staten Island	12.7	13.7	5.0	8.00
Buffalo	13.1	14.5	5.0	7.70
Rochester	13.3	15.0	5.0	8.30
Syracuse	13.2	14.5	5.0	8.30
Boston	11.5	13.0	4.0	8.00
Portland, Me.	12.6	14.4	5.0	8.00
Manchester, N. H.	13.3	15.3	5.0	8.40
Burlington, Vt.	13.1	15.0	5.0	8.20
Spring'fld, Mass.	12.2	13.0	4.0	8.20
Worcester	12.1	13.5	4.0	8.20
Hartford, Conn.	11.9	13.3	4.0	7.90
New Haven	11.8	12.8	4.0	8.00
Providence, R. I.	11.5	13.3	4.0	8.00

*Does not include 2 per cent city sales tax, which is calculated on basis of net retail price exclusive of state and federal taxes. Metropolitan New York prices are undivided dealer prices; others are split dealer.

Effective February 15, 1939, the company changed its commercial consumer policy in New York and New England points for tank-wagon delivery to the following: Annual purchases 10,000 gal. and under, tank-car price plus 2 cents per gallon; annual purchases 10,000 gal. up to 50,000 gal., tank-car price plus 1.5 cents per gallon; annual purchases 50,000 to 200,000 gal., tank-car price plus 1 cent per gallon; annual purchases 200,000 gal. and over, tank-car price plus ½ cent per gallon. Private consumers pay undivided dealer price, plus 2 cents per gallon. Private consumers receiving full compartment deliveries of at least 200 gal. receive a discount of ½ cent per gallon.

Rocky Mountain District

CONTINENTAL OIL CO.

	Gasoline: Tank wag.	Dlr.	Incl. tax	Kero. tank wag.
Denver, Colo.	15.5		5.0	11.5
Grand Junction	18.5		5.0	15.0
Pueblo	16.0		5.0	9.0
Casper, Wyo.	17.5		5.0	11.5
Cheyenne	15.5		5.0	13.0
Billings, Mont.	18.5		6.0	13.0
Butte	20.0		6.0	15.5
Great Falls	19.5		6.0	15.5
Helena	20.5		6.0	15.5
Salt Lake, Utah	12.5	12.5	5.0	16.0
Boise, Idaho	21.1	21.1	6.0	18.0
Twin Falls	21.1	21.1	6.0	18.0
Albu'que, N. M.	17.0	17.0	6.5	10.0
Roswell	16.0	16.0	6.5	8.0
Santa Fe	17.5	17.5	6.5	10.0

*Includes city tax of 0.5 cent. †Includes state tax of 1 mill.

Tank wagon represents price to consumers. Dealer represents price to dealers. If no dealer price is quoted, the tank-wagon price applies to all classes of trade.

Central South District

STANDARD OIL CO. OF LOUISIANA

	Gasoline: Cons. tank car	Dlr. tank wag.	Inc. tax	Kero. tank wag.
New Orleans, La.	15.25	17.75	8.0	†11.0
Baton Rouge	15.25	17.75	8.0	‡10.5
Alexandria	15.25	17.75	8.0	‡12.5
Lafayette	15.00	18.00	8.0	‡11.0
Lake Charles	15.25	17.75	8.0	‡12.5
Shreveport	14.00	16.50	8.0	‡11.0
Knoxville, Tenn.	18.00	20.50	8.0	13.0
Memphis	16.00	18.50	8.0	11.0
Chattanooga	17.50	20.00	8.0	12.0
Nashville	17.00	17.50	8.0	11.0
Bristol	18.25	17.75	8.0	13.0

Essolene at dealer price less 0.5 cent per gallon to undivided dealers.

†Includes 1-cent parish tax and 1-cent state tax. ‡Includes 1-cent state tax.

Price basis to commercial consumers: Effective May 15, 1937, deliveries of 50 gal. or more in one territory take posted consumer tank-wagon price. Accounts taking deliveries of less than 50 gal. at one time pay posted consumer tank-wagon price plus 4 cents per gallon. Generally, the posted consumer tank-wagon price will be equivalent to the dealer price less 0.5 cent per gallon. Kerosene prices include 1-cent state tax.

Effective February 24, 1939, the company reestablished in New Orleans the commercial consumer policy on motor fuel effective in the rest of the state.

Effective December 12, 1938, the company revised its commercial consumer policy on motor fuel in New Orleans, as follows: Single deliveries of less than 50 gal., consumer tank car plus 2 cents per gallon 50 to 199 gal., consumer tank car plus 1 cent per gallon; 200 gal. and over, consumer tank car plus 0.5 cent per gallon.

Nebraska

STANDARD OIL CO. OF NEBRASKA

	Gasoline: Tank wag.	Dlr.	Inc. tax	Kero. tank wag.
Omaha	16.5	13.5	6.0	9.8
McCook	16.5	14.4	6.0	9.5
Norfolk	16.5	15.8	6.0	9.5
North Platte	17.3	14.9	6.0	10.0
Scottsbluff	18.5	15.5	6.0	11.4

Discounts to commercial consumers for tank-wagon deliveries covered only by standard commercial consumers contract, effective January 1, 1935.

Oklahoma and Arkansas

CONTINENTAL OIL CO.

	Gasoline: Tank wag.	Dlr.	Inc. tax	Kero. tank wag.
Texarkana, Ark.	14.0		5.0	8.0
Fort Smith	14.5		5.0	7.5
Little Rock	17.25		7.5	8.0
Muskogee, Okla.	13.0	12.0	5.0	7.0
Oklahoma City	11.0		5.0	6.5
Tulsa	12.0	11.0	5.0	7.5

Tank wagon represents price to consumers. Dealer represents price to dealers. If no dealer price is quoted, the tank-wagon price applies to all classes of trade.

Texas

	Gasoline: Tank wag.	Serv. sta.	Inc. tax	Kero. tank wag.
Dallas, Tex.	12.0	16.0	5.0	7.0
Fort Worth	15.0	19.0	5.0	8.0
Houston	14.0	18.0	5.0	8.0
San Antonio	14.0	18.0	5.0	8.0

Canada

3-Star Imperial Gasoline
IMPERIAL OIL, LTD.

	Tank wag.	Inc. tax	Kero. tank wag.
Halifax, N. S.	24.5	10.0	18.5
St. John, N. B.	24.5	10.0	18.5
Montreal, Que.	23.0	8.0	15.5
Toronto, Ont.	23.5	8.0	16.0
Hamilton, Ont.	23.5	8.0	16.0
Winnipeg, Man.	26.5	7.0	20.5
Brandon, Man.	28.0	7.0	22.9
Regina, Sask.	25.5	7.0	20.5
Saskatoon, Sask.	28.0	7.0	23.0
Edmonton, Alta.	25.9	7.0	20.9
Calgary, Alta.	23.0	7.0	18.0
Vancouver, B. C.	23.0	7.0	23.0

*Imperial gallon used in Canada.

Divided dealers pay tank-wagon prices. Discount to undivided dealers, 1 cent below tank-wagon price. In maritime provinces both divided and undivided dealers pay tank-wagon price.

Naphtha

STANDARD OIL CO. (INDIANA)

	Tank wagon*
Oleum spirits	16.2
V.M.&P. naphtha	16.5
Cleaners' naphtha	15.5
Stanisol	15.5

*Prices include 3-cent Illinois tax but not 1-cent federal tax nor 2 per cent retail occupational tax.

Prices f.o.b. Chicago. Each price subject to discount of 1 cent per gallon for 150-gal. lots if covered by contract.

Tank-Wagon Changes

Standard Oil Co. of Nebraska December 14 reduced tank-wagon gasoline 0.8 cent in Norfolk.

Standard Oil Co. of New Jersey December 20 advanced tank-wagon kerosene 0.35 cent in New Jersey.

Standard Oil Co. of Louisiana December 16 reduced dealer tank-wagon gasoline 2 cents in Nashville.

French Firm Seeks Oil

CALGARY, Alta.—A French firm recently wrote the Anglo-Canadian Oil Co. operating in Turner Valley with a view to arranging for regular supplies of Alberta petroleum products for use in the island of Madagascar. The request was turned over to eastern Canadian refining interests.

Prices of Refined Products

All quotations f.o.b. plant in cars for interstate or export movement except as otherwise noted.

Prices as of December 26, 1939

The following quotations are exclusive of the federal excise taxes of 1 cent a gallon on gasoline and 4 cents a gallon on lubricating oils.

Refinery Gasoline

OKLAHOMA (Group 3)—

U. S. Motor grades:		
62 octane and below	.04	.04⅛
63-66 octane	.04¼	.04⅜
67-69 octane	.04½	.04⅝
70-72 octane (regular)	.04¾	.04⅞
60-62 400 grades:		
62 octane and below	.04	.04⅛
63-66 octane	.04¼	.04⅜
67-69 octane	.04½	.04⅝
70-72 octane (regular)	.04¾	.04⅞
65-70 360	.04⅞	.05⅛

NORTH TEXAS—

U. S. Motor grades:		
62 octane and below	.04	.04⅛
63-66 octane	.04¼	.04⅜
67-69 octane	.04½	.04⅝
70-72 octane (regular)	.04¾	.04⅞
60-62 400	.04	.04⅛

NORTH LOUISIANA (Ark. and N. La. delivery)—

U. S. Motor grades:		
62 octane and below	.04⅝	.04⅝
63-66 octane	.04¾	.05
67-69 octane	no quotations	
70-72 octane (regular)	.05	.05⅛

ARKANSAS (Ark. and N. La. del.)—

U. S. Motor grades:		
62 octane and below		.04⅝
67-69 octane	no quotations	
70-72 octane (regular)		.05⅛

CHICAGO (Based on Group 3)—

U. S. Motor grades:		
62 octane and below	.04½	.04¼
63-66 octane	.04⅝	.04½
67-69 octane	.04⅝	.04¾
70-72 octane (regular)	.04⅞	.05
60-62 400 grades:		
62 octane and below	.04½	.04¼
63-66 octane	.04⅝	.04½
67-69 octane	.04⅝	.04¾
70-72 octane (regular)	.04⅞	.05
68-70 360	.05	.05¼

PENNSYLVANIA (inland refineries)—

58-60 U. S. Motor	.04½	.05
65 octane	.06⅝	.06¾
72-74 octane (regular)	.05¾	.06¼

CALIFORNIA (domestic movement)—

54-58 U. S. Motor	.06	.08
58-60 400, 65 oct. and higher	.07	.09

EAST COAST (domestic)—

U. S. Motor, 65 and above:		
*New York (Bayonne)	.06½	.06¾
Philadelphia	.06¼	.06⅝
Baltimore	.06¼	.06⅝
Charleston, S. C.	.06⅝	.07

*All grades of gasoline ⅛ to ¼ cent less for barge shipments. New York Harbor prices are for New York and New England delivery. Prices for New Jersey delivery ¼ cent lower.

GULF COAST (domestic)—

U. S. Motor grades:		
Below 60 octane	.05½	.05⅝
65-67 octane	.05¾	.06
68-70 octane	.06	.06¼

Natural Gasoline

OKLAHOMA (Group 3)—

Grade 26-70		.02¾
Grade 18-55		.03¼

NORTH TEXAS—

Grade 26-70		.02½
Grade 18-55		.03

CALIFORNIA—

75-85 375-390	.05¾	.06

NORTH LOUISIANA (Ark. and N. La. delivery)—

Grade 26-70		.02⅞

Tractor Fuel

OKLAHOMA (Group 3)—

40-42 gr., 315-325 i.b.p., 110-flash, 540-550 e.p.	.03½	.03⅝
41-43 gr., 300-320 i.b.p., 110-125 flash, 500-520 e.p.	.03⅝	.03¾
46-48 gr., 210-230 i.b.p., 480-max., e.p.	.03⅝	.04⅛

Kerosene

(All kerosene water white)

OKLAHOMA (Group 3)—

41-43	.03⅝	.03¾
42-44	.03¾	.04

NORTH TEXAS—

41-43	.03⅝	.03¾

NORTH LOUISIANA (Ark. and N. La. delivery)—

41-43	.03½	.03⅝

ARKANSAS (Ark. and N. La. del.)—

41-43		.03⅝

PENNSYLVANIA (inland refineries)—

45	.04½	.05
46	.04⅝	.05
47	.04¾	.05⅛

CHICAGO (Based on Group 3)—

41-43	.03⅝	.03¾
42-44	.03¾	.04

CALIFORNIA (Pac. Coast market)—

38-43 high burning test	.04½	.05¾

NEW YORK (Bayonne, N. J.)—

41-43		.052

***GULF COAST (domestic)—**

41-43	.04½	.04¾

*Barge price ⅛ cent lower.

Furnace Oil

OKLAHOMA (Group 3)—

Range oil	.03½	.03⅝
No. 1 prime white, 38-42	.03½	.03¾
No. 1 straw, 38-40	.03⅝	.03½
No. 2 straw, 32-36	.03¼	.03⅜
No. 2 dark, 32-36	.03⅛	.03¼
No. 3 zero to 15, 28-32	.03	.03⅛
No. 3, 15 and above, 28-32	.02¾	.03

NORTH TEXAS—

No. 1 prime white, 38-42	.03½	.03⅝
No. 1 straw, 38-40	.03⅜	.03½

NORTH LOUISIANA (Ark. and N. La. delivery)—

No. 2, 32-36	.03	.03⅛

ARKANSAS (Ark. and N. La. del.)—

No. 2, 32-36		.03⅜

CHICAGO (Based on Group 3)—

Range oil	.03½	.03⅝
No. 1 prime white, 38-40	.03½	.03⅝
No. 1 straw, 38-40	.03⅜	.03½
No. 2 straw, 32-36	.03¼	.03⅜
No. 2 dark, 32-36	.03⅛	.03¼
No. 3, zero to 15, 28-32	.03⅛	.03¼
No. 3, 15 and above, 28-32	.02¾	.03

NEW YORK (Bayonne, N. J.)—

*No. 1	.05	.05¼
*No. 2	.04½	.04⅝
*No. 4	.04¼	.04½

*Barge deliveries ⅛ to ¼ cent under above tank-car price.

Gas Oil and Fuel Oil

(Gas oil per gal., fuel oil per bbl.)

OKLAHOMA (Group 3)—

U.G.I. gas oil, under 35	.02⅝	.02¾
No. 5, low pour point, 18-22	.70	.75
Below 14 fuel oil, industrial	.47½	.52½

NORTH TEXAS—

U.G.I. gas oil, under 35	.02⅝	.02¾
No. 5, low pour point, 18-22	.70	.75
Below 14 fuel oil, industrial	.47½	.52½

NORTH LOUISIANA (Ark. and N. La. delivery)—

10-14 fuel oil, industrial	.70	.75

CHICAGO (Based on Group 3)—

U.G.I. gas oil	.02⅝	.02⅞
No. 5, low pour point, 18-22	.70	.80
No. 5, 15 and above, 18-22	.60	.70
No. 6, low pour point, 10-16	.60	.70
No. 6, 15 and above, 10-16	.45	.50

PENNSYLVANIA (inland refineries)—

36-40	.03⅞	.04¼

CALIFORNIA—

Los Angeles:

30-40 gas oil, per bbl.	1.20	1.30
24 plus diesel, per bbl.	1.15	1.30
24 plus diesel (bunkers)	1.25	1.40
12-16 (bunkers at tidewater)	.70	.90
10-16 (cargo lots)	.75	.90
12-17 (tank cars)	.60	.80
10-17 (high sulfur)	.55	.70

San Joaquin Valley:

10-18 (tank cars)	.55	.75
24 plus diesel, per bbl.	1.15	1.25

San Francisco:

24 plus diesel, per bbl.	1.40	1.45
24 plus diesel (bunkers)	1.50	1.55
10-16 (bunkers)	.85	.95

GULF COAST—

No. 2 fuel		.04¼
43-47 diesel		.04
48-52 diesel		.04¼
53-57 diesel		.04½
58 and above diesel		.04¾
Bunker C (bulk cargoes)	.95	1.00
Bunker C (bunkers)		.90

NEW YORK (Bayonne, N. J.)—

27 plus, gas oil		.04¼
28-30 diesel (lighterage 6¼c per bbl.)		2.10
28-30 diesel (tank cars)		.04¼
Bunker C (to ocean-going ships in N. Y. Harbor)		1.50
Industrial fuel (tank cars)		.04

Lighterage charge 5c bbl. additional.

Bright and Steam Refined

OKLAHOMA (Group 3)—

190-200 D, 15-25		.28
150-160 D, 0-10		.25
150-160 D, 15-25		.24
150-160 E, 15-25		.24
100-110 D, 0-10		.24
Steam refined:		
600 dark green (untreated)		.08

PENNSYLVANIA—

Bright Stocks (Pennsylvania Grade No. 8 color, 140-150 at 210, 545-550 flash):

100 pour point	.35	.38
15 pour point	.34	.37
25 pour point	.30	.33
Steam refined:		
600	.17½	.18
650	.19	.21
600 flash	.19½	.22
630 flash	.23	.27

Neutral Oil

(Vis. at 100° F. except Pennsylvania and color N.G.A.)

OKLAHOMA (Group 3)—

0-10 pour point:		
150-3		.13
180-3		.14
180-4		.13½
200-3		.14½
200-4		.14
250-3		.16
250-4		.15½
280-3		.17
280-4		.16½
300-3½		.17½
400-3½		.18½
100-2½ paraffin oil		.07½
15-25 pour point:		
200-3		.14
200-4		.13½
250-3		.15½
250-4		.15
280-3		.16½
280-4		.16

GULF COAST—

Pale oils:		
200-3	.07¼	.07½
300-3	.07⅝	.08
500-3½	.08½	.09
750-3½	.09	.09½
1,200-3½	.09⅝	.10
2,000-4		.10¼
Red oils:		
200-5-6	.07	.07¼
300-5-6	.07½	.07⅝
500-5-6	.08¼	.08¾
750	.08⅝	.09½
1,200-5-6	.09⅝	.09⅝

CALIFORNIA (moving to dom. market)—

Pale oils:		
100-2½-3	.07¼	.08
200-2½-3	.07¼	.08
300-2½-3	.07¼	.08
400-3-4	.07¼	.08
450-3-4	.07¼	.08
550-3-4	.09	.11
600-3-4	.09	.11
Red oils:		
200-4-5	.07¼	.08
300-5-6	.07¼	.08
350-5-6	.09¼	.11½
400-5-6	.09¼	.11½
450-5-6	.09¼	.11½
500-5-6	.09¼	.11½
600-5-6½	.09¼	.11½
700-6½ plus	.09¼	.11½
750-6½ plus	.09¼	.11½
900-6½ plus	.09¼	.11½

PENNSYLVANIA—

150 vis. at 70° F., 3 color, 400-405 flash:		
Zero pour point	.33	.35
10 pour point	.32	.34
15 pour point	.31	.33
25 pour point	.28	.30
200 vis. at 70° F., 3 color:		
Zero pour point	.35	.37
10 pour point	.34	.36
15 pour point	.33	.35
25 pour point	.30	.34

Wax and Petrolatum

(Prices per pound)

OKLAHOMA (Group 3)—

124-126 (A.m.p.) w.c. scale	.0675	.0687½

PENNSYLVANIA (inland refineries)—

122-124 (A.m.p.) w.c. scale	.0675	.0700
124-126 (A.m.p.) w.c. scale	.0675	.0700

NEW YORK—

Wax in bags fully refined:		
123-125 (A.m.p.) wax	.0635	.0640
125-127 (A.m.p.) wax	.0650	.0655
128-130 (A.m.p.) wax	.0665	.0675
130-132 (A.m.p.) wax		.0700
133-135 (A.m.p.) wax	.0720	.0730
135-137 (A.m.p.) wax	.0755	.0760
Crude scale:		
124-126 (A.m.p.) w.s.		.0700
124-126 (A.m.p.) y.s.		.0700
Petrolatum in barrels, carload lots:		
Dark green		.03½
Amber		.03⅞
Extra amber		.04
Lily white		.06½
Snow white		.07⅝
Cream		.05½

Export Prices

GASOLINE

GULF COAST—

U. S. Motor	.05	.05⅛
60-62 400	.05½	.06
65 octane	.05⅝	.06⅛
68 octane	.06	.06¼
70 octane	.06⅛	.06⅜

LOS ANGELES—

U. S. Motor grades:		
60-65 octane	.05½	.05⅝
65-69 octane	.05⅝	.06¼
Above 69 octane	.06¼	.06½

KEROSENE

GULF COAST—

41-43 prime white		.05⅛
41-43 water white		.05¼

LOS ANGELES—

41-43 water white	.05	.05¼

LUBRICANTS

(Pennsylvania Grade)

NEW YORK (f.o.s.) in bbls.—

Cylinder stocks:		
600 S.R. unfiltered	.25	.26½
650 S.R. unfiltered	.27	.28½
600 flash, S.R.	.28	.30½
630 flash, S.R.	.30	.34
Bright stock:		
8 color	.40	.42

NEUTRAL OIL

200-3 color	.38	.43
150-3 color	.37	.40

PARAFFIN WAX

NEW YORK (prices per pound)—

123-125 A.m.p.		.0700
125-127 A.m.p.		.0750
128-130 A.m.p.		.0775
133-135 A.m.p.		.0850
135-137 A.m.p.		.0900
Crude scale:		
122-124 w.s.		.0650
124-126 w.s.		.0700
122-124 y.s.		.0675
124-126 y.s.		.0700

Retail Oil Markets

Tank-wagon and filling station prices on gasoline and kerosene furnished by the larger marketing firms

Prices as of December 26, 1939

Taxes

The gasoline quotations given in the following tables include the 1-cent federal tax, as well as state, county, and city taxes. The gasoline is the regular or standard grade. In most areas lower grades and a premium grade also are available.

Standard Oil Co. (Indiana)

	Gasoline			Kero.
	Tank wag.	Dir.	Inc. tax	tank wag.
Chicago, Ill.	15.1	13.1	4.0	10.0
Decatur	15.1	12.1	4.0	8.5
Joliet	15.1	13.6	4.0	10.0
Peoria	15.1	12.7	4.0	10.0
Quincy	14.9	13.4	4.0	9.8
Davenport, Ia.	15.1	13.6	4.0	†10.0
Des Moines	14.9	13.4	4.0	†9.8
Mason City	15.3	13.8	4.0	†10.2
Duluth, Minn.	16.9	15.4	5.0	10.8
Mankato	16.5	15.0	5.0	9.9
Minneapolis	16.5	15.0	5.0	10.4
LaCrosse, Wis.	16.5	15.0	5.0	10.4
Green Bay	16.9	15.4	5.0	10.0
Milwaukee	16.3	14.8	5.0	10.2
Detroit, Mich.	13.6	12.1	4.0	7.6
Grand Rapids	13.9	12.4	4.0	9.7
Saginaw	14.8	13.3	4.0	9.3
Evansville, Ind.	16.6	15.1	5.0	†10.5
Indianapolis	16.8	14.3	5.0	†10.0
South Bend	16.8	15.3	5.0	†10.0
Fargo, N. D.	17.7	16.2	5.0	11.6
Huron, S. D.	17.0	15.5	5.0	10.9
Kans. City, Mo.*	14.4	12.9	4.0	8.0
St. Louis*	14.7	13.2	4.0	8.0
St. Joseph	14.4	12.9	4.0	7.9
Wichita, Kans.	13.3	11.1	4.0	7.9

*State tax 2 cents, 1-cent city tax and 1-cent federal tax. †Does not include 4-cent state tax. ‡Does not include 3-cent state tax.

Exclusive of state general sales taxes.

Discounts to commercial consumers: On purchases per month off tank-wagon prices: 1,000 gal. or more, 1.5 cents off; minimum delivery 25 gal.

Stanolex Fuel Oil in Chicago

Effective December 12, 1939, f.o.b. Chicago tank-wagon prices: Standard heater oil, 1-99 gal., 9 cents; 100-149 gal., 8 cents; 150 gal. and over, 7.5 cents. Stanolex fuel oil No. 1, 1-149 gal., 8.25 cents; 150-399 gal., 7.25 cents; 400 gal. and over, 6.75 cents. Stanolex furnace oil, 1-149 gal., 8.25 cents; 150-399 gal., 7.25 cents; 400 gal. and over, 6.75 cents. Stanolex Grade A, 1-399 gal., 5.5 cents; 400 gal. and over, 4.5 cents. Stanolex Grade B, 1-799 gal., 5.25 cents; 800 gal. and over, 4.25 cents. Stanolex Grade C, 1-999 gal., 4.5 cents; 1,000 gal. and over, 3.5 cents.

Ohio

STANDARD OIL CO. OF OHIO

	Gasoline			Kero.
	Tank-wag. cons'r.	Di-vided dir.	Inc. tax	tank wag.
Ohio points	16.0	15.0	5.0	*13.0

*Includes state tax of 1 cent.

Atlantic Coast District

STANDARD OIL CO. OF NEW JERSEY

	Gasoline			Kero.
	Cons'r. tank car	Dir. tank wag.	Inc. tax	tank wag.
Atl'tic City, N. J.	11.6	12.7	4.0	8.1
Newark	11.6	12.7	4.0	8.1
Annapolis, Md.	13.35	14.35	5.0	9.5
Baltimore	12.75	13.75	5.0	7.5
Cumberland	14.15	16.15	5.0	10.0
Wash'gton, D. C.	11.00	12.0	3.0	9.5
Danville, Va.	14.95	17.45	6.0	12.9
Norfolk	13.75	16.25	6.0	11.0
Petersburg	14.05	16.55	6.0	11.7
Richmond	14.05	16.55	6.0	10.7
Roanoke	15.25	17.75	6.0	11.0
Charles'n, W. Va.	14.55	17.05	6.0	12.6
Parkersburg	13.85	15.35	6.0	11.2
Wheeling	14.85	16.75	6.0	12.2
Charlotte, N. C.	16.90	18.40	7.0	11.8
Hickory	17.45	18.95	7.0	12.3
Mt. Airy	17.30	18.80	7.0	12.2
Raleigh	16.85	18.15	7.0	11.5
Salisbury	16.95	18.45	7.0	11.9
Charleston, S. C.	14.75	17.25	7.0	10.6
Columbia	15.60	18.10	7.0	11.5
Spartanburg	16.30	18.80	7.0	12.2

Price basis to Essolene undivided dealers: Dealer tank-wagon price less 0.5 cent per gallon. Price basis to commercial consumers, effective March 8, 1937, in Maryland, District of Columbia, and in Arlington and Fairfax counties in Virginia; and March 12 in New Jersey: To contract accounts purchasing at least one full compartment at time by hose connection, on yearly purchases: From 2,500 to 100,000 gal., consumer tank-wagon price at time and place of delivery; 100,000 gal. per year, consumer tank-car price plus .5 cent per gallon. Consumer tank-wagon price generally will be equivalent to dealer tank-wagon price less .5 cent per gallon.

Effective January 16, 1939, in North Carolina the commercial consumer schedule became as follows: Single deliveries of 50 gal. or more, consumer tank-wagon price. Single deliveries of less than 50 gal., 4 cents per gallon over consumer tank-wagon price. Generally the posted consumer tank-wagon price will be equivalent to the dealer price, less .5 cent per gallon. The above policy also applies in South Carolina effective January 23, 1939.

Discounts for kerosene, 1 cent off tank-wagon price for 25 gal. or more under contract (contract not necessary in Baltimore) except no discount in New Jersey.

Southern District

STANDARD OIL CO. (KENTUCKY)

	Gasoline			Kero.
	Cons'r. tank wag.	Net dlr.	Inc. tax	tank wag.
Atlanta, Ga.	21.0	18.0	7.0	9.0
Augusta	20.5	17.5	7.0	10.0
Macon	21.0	18.0	7.0	10.5
Savannah	19.5	16.5	7.0	9.0
Birmingham, Ala.	21.5	18.5	8.0	9.0
Mobile	21.5	18.5	9.0	8.0
Montgomery	22.5	19.5	9.0	11.0
Jackson, Miss.	19.5	16.5	7.0	10.0
Vicksburg	19.5	16.5	7.0	9.5
Jacksonville, Fla.	19.0	16.0	8.0	8.0
Miami	20.0	17.0	8.0	7.0
Pensacola	21.5	18.5	9.0	8.5
Tampa	21.0	18.0	8.0	8.5
Lexington, Ky.	19.5	16.5	6.0	10.0
Covington	18.0	15.0	6.0	9.5
Louisville	18.5	15.5	6.0	9.0
Paducah	18.5	15.5	6.0	9.0

Price basis to tank-wagon consumers: Effective January 4, 1937; 3 cents per gallon below tank-wagon price.

Montgomery, Ala., has a county tax of 1 cent per gallon, and a city tax of 1 cent per gallon on gasoline, in addition to state tax and 1 cent per gallon on kerosene. Mobile, Ala., has a city gasoline tax of 2 cents per gallon; Birmingham, Ala., has a city gasoline tax of 1 cent per gallon; Pensacola, Fla., has a city gasoline tax of 1 cent. All are included in the table.

Pennsylvania and Delaware

ATLANTIC REFINING CO.

	Gasoline			Kero.
	Cons'r. tank car	Dir. tank wag.	Inc. tax	tank wag.
Philadelphia, Pa.	13.0	14.0	5.0	10.0
Pittsburgh	13.0	14.5	5.0	10.5
Allentown	13.0	14.5	5.0	10.5
Erie	13.0	14.5	5.0	10.0
Scranton*	13.5	15.0	5.0	10.5
Altoona	13.0	15.0	5.0	10.5
Dover, Del	...	14.5	5.0	10.5
Wilmington	...	14.0	5.0	9.75

Price basis to undivided dealers, dealer tank-wagon price less .5 cent per gallon.

*Voluntary discount of 1 cent allowed to dealers only.

Discount on kerosene, 2 cents per gallon off tank-wagon price on tank-wagon deliveries of 25 gal. or more at one time.

Pacific Coast Territory

STANDARD OIL CO. OF CALIFORNIA

	Gasoline			Kero.
	Tank truck	Serv. sta.	Inc. tax	tank wag.
San Francisco	17.5	18.5	4.0	11.5
Los Angeles	17.0	18.0	4.0	10.0
Fresno, Calif.	18.5	19.5	4.0	12.5
Phoenix, Ariz.	20.0	21.0	6.0	*17.5
Reno, Nev.	20.5	21.5	5.0	13.5
Portland, Ore.	20.0	21.0	6.0	13.5
Seattle, Wash.	20.0	21.0	6.0	†13.75
Spokane	21.5	22.5	6.0	†16.75
Tacoma	20.0	21.0	6.0	†13.75

*Includes 5-cent state tax. †Includes 0.25-cent state tax.

Discounts to dealers: On gasoline, off tank-wagon price, to 100 per cent dealers, 3 cents. To commercial consumers: On tank-wagon price; on single deliveries of 40 gal. and over, advance quantity discount extended at time of delivery, 2 cents. Service-station schedule applies on single deliveries less than 40 gal. On kerosene in tank-car, transport-truck and trailer delivery, 3 cents off tank-wagon price; plant deliveries to jobbers, 2.5 cents below tank wagon.

March 18, 1939, split dealer discount was canceled.

New York and New England

SOCONY-VACUUM OIL CO., INC.

	Gasoline			Kero.
	Cons'r. tank car	Dir. tank wag.	Inc. tax	tank wag.
Albany	12.6	14.2	5.0	7.80
*Met. N. Y.: Manhat., Bronx Queens, Br'klyn Staten Island	12.7	13.7	5.0	8.00
Buffalo	13.1	14.5	5.0	7.70
Rochester	13.3	15.0	5.0	8.30
Syracuse	13.2	14.5	5.0	8.30
Boston	11.5	13.0	4.0	8.00
Portland, Me.	12.6	14.4	5.0	8.00
Manchester, N. H.	13.3	15.3	5.0	8.40
Burlington, Vt.	13.1	15.0	5.0	8.20
Spring'fld, Mass.	12.2	13.0	4.0	8.20
Worcester	12.1	13.5	4.0	8.20
Hartford, Conn.	11.9	13.3	4.0	7.90
New Haven	11.8	12.8	4.0	8.00
Providence, R. I.	11.5	13.3	4.0	8.00

*Does not include 2 per cent city sales tax, which is calculated on basis of net retail price exclusive of state and federal taxes. Metropolitan New York prices are undivided dealer prices; others are split dealer.

Effective February 15, 1939, the company changed its commercial consumer policy in New York and New England points for tank-wagon delivery to the following: Annual purchases 10,000 gal. and under, tank-car price plus 2 cents per gallon; annual purchases 10,000 gal. up to 50,000 gal., tank-car price plus 1.5 cents per gallon; annual purchases 50,000 to 200,000 gal., tank-car price plus 1 cent per gallon; annual purchases 200,000 gal. and over, tank-car price plus ⅛ cent per gallon. Private consumers pay undivided dealer price, plus 2 cents per gallon. Private consumers receiving full compartment deliveries of at least 200 gal. receive a discount of ⅛ cent per gallon.

Rocky Mountain District

CONTINENTAL OIL CO.

	Gasoline			Kero.
	Tank wag.	Dir.	Incl. tax	tank wag.
Denver, Colo.	15.5	...	5.0	11.5
Grand Junction	18.5	...	5.0	15.0
Pueblo	16.0	...	5.0	9.0
Casper, Wyo.	17.5	...	5.0	11.5
Cheyenne	15.5	...	5.0	13.0
Billings, Mont.	18.5	...	6.0	13.0
Butte	20.0	...	6.0	15.5
Great Falls	19.5	...	6.0	15.5
Helena	20.5	...	6.0	15.5
Salt Lake, Utah	12.5	12.5	5.0	16.0
Boise, Idaho	21.1	21.1	6.0	18.0
Twin Falls	21.1	21.1	6.0	18.0
Albu'que, N. M.	17.0	17.0	6.5	10.0
Roswell	16.0	16.0	6.5	8.0
Santa Fe	17.5	17.5	6.5	10.0

*Includes city tax of 0.5 cent. †Includes state tax of 1 mill.

Tank wagon represents price to consumers. Dealer represents price to dealers. If no dealer price is quoted, the tank-wagon price applies to all classes of trade.

Central South District

STANDARD OIL CO. OF LOUISIANA

	Gasoline			Kero.
	Cons. tank car	Dir. tank wag.	Inc. tax	tank wag.
New Orleans, La.	15.25	17.75	8.0	†11.0
Baton Rouge	15.25	17.75	8.0	‡10.5
Alexandria	15.25	17.75	8.0	‡12.5
Lafayette	15.00	18.00	8.0	‡11.0
Lake Charles	15.25	17.75	8.0	‡12.5
Shreveport	14.00	16.50	8.0	‡11.0
Knoxville, Tenn.	18.00	20.50	8.0	13.0
Memphis	16.00	18.50	8.0	11.0
Chattanooga	17.50	20.00	8.0	12.0
Nashville	17.00	17.50	8.0	11.0
Bristol	18.25	17.75	8.0	13.0

Essolene at dealer price less 0.5 cent per gallon to undivided dealers.

†Includes 1-cent parish tax and 1-cent state tax. ‡Includes 1-cent state tax.

Price basis to commercial consumers: Effective May 15, 1937, deliveries of 50 gal. or more in one territory take posted consumer tank-wagon price. Accounts taking deliveries of less than 50 gal. at one time pay posted consumer tank-wagon price plus 4 cents per gallon. Generally, the posted consumer tank-wagon price will be equivalent to the dealer price less 0.5 cent per gallon. Kerosene prices include 1-cent state tax.

Effective February 24, 1939, the company reestablished in New Orleans the commercial consumer policy on motor fuel effective in the rest of the state.

Effective December 12, 1938, the company revised its commercial consumer policy on motor fuel in New Orleans, as follows: Single deliveries of less than 50 gal., consumer tank car plus 2 cents per gallon 50 to 199 gal., consumer tank car plus 1 cent per gallon; 200 gal. and over, consumer tank car plus 0.5 cent per gallon.

Nebraska

STANDARD OIL CO. OF NEBRASKA

	Gasoline			Kero.
	Tank wag.	Dir.	Inc. tax	tank wag.
Omaha	16.5	13.5	6.0	9.8
McCook	16.5	14.4	6.0	9.8
Norfolk	16.5	15.8	6.0	9.5
North Platte	17.8	14.9	6.0	10.0
Scottsbluff	18.5	15.5	6.0	11.4

Discounts to commercial consumers for tank-wagon deliveries covered only by standard commercial consumers contract, effective January 1, 1935.

Oklahoma and Arkansas

CONTINENTAL OIL CO.

	Gasoline			Kero.
	Tank wag.	Dir.	Inc. tax	tank wag.
Texarkana, Ark.	14.0	...	5.0	8.0
Fort Smith	14.5	...	5.0	7.5
Little Rock	17.25	...	7.5	8.0
Muskogee, Okla.	13.0	12.0	5.0	7.0
Oklahoma City	11.0	...	5.0	6.5
Tulsa	12.0	11.0	5.0	7.5

Tank wagon represents price to consumers. Dealer represents price to dealers. If no dealer price is quoted, the tank-wagon price applies to all classes of trade.

Texas

	Gasoline			Kero.
	Tank wag.	Serv. sta.	Inc. tax	tank wag.
Dallas, Tex.	12.0	16.0	5.0	7.0
Fort Worth	15.0	19.0	5.0	8.0
Houston	14.0	18.0	5.0	8.0
San Antonio	14.0	18.0	5.0	8.0

Canada

3-Star Imperial Gasoline
IMPERIAL OIL, LTD.

	Tank wag.	Inc. tax	Kero. tank wag
Halifax, N. S.	24.5	10.0	18.5
St. John, N. B.	24.5	10.0	18.5
Montreal, Que.	23.0	8.0	15.5
Toronto, Ont.	23.5	8.0	16.0
Hamilton, Ont.	23.5	8.0	16.0
Winnipeg, Man.	26.5	7.0	20.5
Brandon, Man.	28.0	7.0	22.9
Regina, Sask.	25.5	7.0	20.5
Saskatoon, Sask.	28.0	7.0	23.0
Edmonton, Alta.	25.9	7.0	20.9
Calgary, Alta.	23.0	7.0	18.0
Vancouver, B. C.	23.0	7.0	23.0

*Imperial gallon used in Canada.

Divided dealers pay tank-wagon prices. Discount to undivided dealers, 1 cent below tank-wagon price. In maritime provinces both divided and undivided dealers pay tank-wagon price.

Naphtha

STANDARD OIL CO. (INDIANA)

	Tank wagon*
Oleum spirits	16.2
V.M.&P. naphtha	16.5
Cleaners' naphtha	15.5
Stanisol	15.5

*Prices include 3-cent Illinois tax but not 1-cent federal tax nor 2 per cent retail occupational tax.

Prices f.o.b. Chicago. Each price subject to discount of 1 cent per gallon for 150-gal. lots if covered by contract.

Tank-Wagon Changes

Standard Oil Co. of Nebraska December 14 reduced tank-wagon gasoline 0.8 cent in Norfolk.

Standard Oil Co. of New Jersey December 20 advanced tank-wagon kerosene 0.35 cent in New Jersey.

Standard Oil Co. of Louisiana December 16 reduced dealer tank-wagon gasoline 2 cents in Nashville.

French Firm Seeks Oil

CALGARY, Alta.—A French firm recently wrote the Anglo-Canadian Oil Co. operating in Turner Valley with a view to arranging for regular supplies of Alberta petroleum products for use in the island of Madagascar. The request was turned over to eastern Canadian refining interests.

Prices of Refined Products

All quotations f.o.b. plant in cars for interstate or export movement except as otherwise noted

Prices as of December 26, 1939

The following quotations are exclusive of the federal excise taxes of 1 cent a gallon on gasoline and 4 cents a gallon on lubricating oils.

Refinery Gasoline

OKLAHOMA (Group 3)—

U. S. Motor grades:		
62 octane and below	.04	.04½
63-66 octane	.04½	.04⅝
67-69 octane	.04½	.04⅝
70-72 octane (regular)	.04¾	.04⅞
60-62 400 grades:		
62 octane and below	.04	.04½
63-66 octane	.04¼	.04⅝
67-69 octane	.04½	.04⅝
70-72 octane (regular)	.04¾	.04⅞
68-70 360	.04⅞	.05⅛

NORTH TEXAS—

U. S. Motor grades:		
62 octane and below	.04	.04½
63-66 octane	.04¼	.04⅜
67-69 octane	.04½	.04⅝
70-72 octane (regular)	.04¾	.04⅞
60-62 400	.04	.04½

NORTH LOUISIANA (Ark. and N. La. delivery)—

U. S. Motor grades:		
62 octane and below	.04⅜	.04⅝
63-66 octane	.04¾	.05
67-69 octane	no quotations	
70-72 octane (regular)	.05	.05⅛

ARKANSAS (Ark. and N. La. del.)—

U. S. Motor grades:		
62 octane and below		.04⅜
67-69 octane	no quotations	
70-72 octane (regular)		.05⅛

CHICAGO (Based on Group 3)—

U. S. Motor grades:		
62 octane and below	.04½	.04½
63-66 octane	.04⅝	.04⅞
67-69 octane	.04⅝	.04¾
70-72 octane (regular)	.04⅞	.05
60-62 400 grades:		
62 octane and below	.04½	.04½
63-66 octane	.04⅝	.04⅞
67-69 octane	.04⅝	.04¾
70-72 octane (regular)	.04⅞	.05
68-70 360	.05	.05⅛

PENNSYLVANIA (Inland refineries)—

58-60 U. S. Motor	.04½	.05
65 octane	.06⅝	.06¾
72-74 octane (regular)	.05¾	.06¼

CALIFORNIA (domestic movement)—

54-58 U. S. Motor	.06	.08
58-60 400, 65 oct. and higher	.07	.09

EAST COAST (domestic)—

U. S. Motor, 65 and above:		
*New York (Bayonne)	.06½	.06¾
Philadelphia	.06¼	.06¾
Baltimore	.06¼	.06¾
Charleston, S. C.	.06⅝	.07

*All grades of gasoline ⅛ to ¼ cent less for barge shipments. New York Harbor prices are for New York and New England delivery. Prices for New Jersey delivery ¼ cent lower.

GULF COAST (domestic)—

U. S. Motor grades:		
Below 60 octane	.05½	.05⅝
65-67 octane	.05⅝	.06
68-70 octane	.06	.06¼

Natural Gasoline

OKLAHOMA (Group 3)—

Grade 26-70		.02¾
Grade 18-55		.03¼

NORTH TEXAS—

Grade 26-70		.02½
Grade 18-55		.03

CALIFORNIA—

75-85 375-390	.05¾	.06

NORTH LOUISIANA (Ark. and N. La. delivery)—

Grade 26-70		.02⅞

Tractor Fuel

OKLAHOMA (Group 3)—

40-42 gr., 315-325 i.b.p., 110-flash, 540-550 e.p.	.03¼	.03⅜
41-43 gr., 300-320 i.b.p., 110-125 flash, 500-520 e.p.	.03⅜	.03¾
46-48 gr., 210-230 i.b.p., 480-max., e.p.	.03⅞	.04¼

Kerosene

(All kerosene water white)

OKLAHOMA (Group 3)—

41-43	.03⅝	.03⅞
42-44	.03¾	.04

NORTH TEXAS—

41-43	.03⅝	.03¾

NORTH LOUISIANA (Ark. and N. La. delivery)—

41-43	.03½	.03⅝

ARKANSAS (Ark. and N. La. del.)—

41-43		.03⅝

PENNSYLVANIA (Inland refineries)—

45	.04½	.05
46	.04¾	.05
47	.04¾	.05⅛

CHICAGO (Based on Group 3)—

41-43	.03⅝	.03⅞
42-44	.03¾	.04

CALIFORNIA (Pac. Coast market)—

38-43 high burning test	.04½	.05¾

NEW YORK (Bayonne, N. J.)—

41-43		.052

***GULF COAST (domestic)—**

41-43	.04½	.04¾

*Barge price ⅛ cent lower.

Furnace Oil

OKLAHOMA (Group 3)—

Range oil	.03½	.03⅝
No. 1 prime white, 38-42	.03½	.03⅝
No. 1 straw, 38-40	.03⅝	.03½
No. 2 straw, 32-36	.03¼	.03⅜
No. 2 dark, 32-36	.03⅛	.03¼
No. 3 zero to 15, 28-32	.03	.03⅛
No. 3, 15 and above, 28-32	.02⅝	.03

NORTH TEXAS—

No. 1 prime white, 38-42	.03½	.03⅝
No. 1 straw, 38-40	.03⅝	.03½

NORTH LOUISIANA (Ark. and N. La. delivery)—

No. 2, 32-36	.03	.03⅛

ARKANSAS (Ark. and N. La. del.)—

No. 2, 32-36		.03⅜

CHICAGO (Based on Group 3)—

Range oil	.03½	.03⅝
No. 1 prime white, 38-40	.03½	.03⅝
No. 1 straw, 38-40	.03⅝	.03½
No. 2 straw, 32-36	.03¼	.03⅜
No. 2 dark, 32-36	.03⅛	.03¼
No. 3, zero to 15, 28-32	.03⅛	.03¼
No. 3, 15 and above, 28-32	.02⅝	.03

NEW YORK (Bayonne, N. J.)—

*No. 1	.05	.05¼
*No. 2	.04½	.04⅝
*No. 4	.04¼	.04½

*Barge deliveries ⅛ to ¼ cent under above tank-car price.

Gas Oil and Fuel Oil

(Gas oil per gal., fuel oil per bbl.)

OKLAHOMA (Group 3)—

U.G.I. gas oil, under 35	.02⅝	.02⅝
No. 5, low pour point, 18-22	.70	.75
Below 14 fuel oil, industrial	.47½	.52½

NORTH TEXAS—

U.G.I. gas oil, under 35	.02⅝	.02⅝
No. 5, low pour point, 18-22	.70	.75
Below 14 fuel oil, industrial	.47½	.52½

NORTH LOUISIANA (Ark. and N. La. delivery)—

10-14 fuel oil, industrial	.70	.75

CHICAGO (Based on Group 3)—

U.G.I. gas oil	.02⅝	.02⅞
No. 5, low pour point, 18-22	.70	.80
No. 5, 15 and above, 18-22	.60	.70
No. 6, low pour point, 10-16	.60	.70
No. 6, 15 and above, 10-16	.45	.50

PENNSYLVANIA (Inland refineries)—

36-40	.03⅞	.04¼

CALIFORNIA—

Los Angeles:

30-40 gas oil, per bbl.	1.20	1.30
24 plus diesel, per bbl.	1.15	1.30
24 plus diesel (bunkers)	1.25	1.40
12-16 (bunkers at tidewater)	.70	.90
10-16 (cargo lots)	.75	.90
12-17 (tank cars)	.60	.80
10-17 (high sulfur)	.55	.70

San Joaquin Valley:

10-18 (tank cars)	.55	.75
24 plus diesel, per bbl.	1.15	1.25

San Francisco:

24 plus diesel, per bbl.	1.40	1.45
24 plus diesel (bunkers)	1.50	1.55
10-16 (bunkers)	.85	.95

GULF COAST—

No. 2 fuel		.04¼
43-47 diesel		.04
48-52 diesel		.04¼
53-57 diesel		.04½
58 and above diesel		.04¾
Bunker C (bulk cargoes)	.95	1.00
Bunker C (bunkers)		.90

NEW YORK (Bayonne, N. J.)—

27 plus, gas oil		.04¼
28-30 diesel (lighterage 6¼c per bbl.)		2.10
28-30 diesel (tank cars)		.04¼
Bunker C (to ocean-going ships in N. Y. Harbor)		1.50
Industrial fuel (tank cars)		.04

Lighterage charge 5c bbl. additional.

Bright and Steam Refined

OKLAHOMA (Group 3)—

190-200 D, 15-25		.28
150-160 D, 0-10		.25
150-160 D, 15-25		.24
150-160 E, 15-25		.24
100-110 D, 0-10		.24
Steam refined:		
600 dark green (untreated)		.08

PENNSYLVANIA—

Bright Stocks (Pennsylvania Grade No. 8 color, 140-150 at 210, 545-550 flash):		
100 pour point	.35	.38
15 pour point	.34	.37
25 pour point	.30	.33
Steam refined:		
600	.17½	.18
650	.19	.21
600 flash	.19½	.22
630 flash	.23	.27

Neutral Oil

(Vis. at 100° F. except Pennsylvania and color N.G.A.)

OKLAHOMA (Group 3)—

0-10 pour point:		
150-3		.13
180-3		.14
180-4		.13½
200-3		.14½
200-4		.14
250-3		.16
250-4		.15½
280-3		.17
280-4		.16½
300-3½		.17½
400-3½		.18¼
100-2½ paraffin oil		.07½
15-25 pour point:		
200-3		.14
200-4		.13½
250-3		.15½
250-4		.15
280-3		.16½
280-4		.16

GULF COAST—

Pale oils:		
200-3	.07¼	.07½
300-3	.07¾	.08
500-3½	.08½	.09
750-3½	.09	.09½
1,200-3½	.09¾	.10
2,000-4		.10¼
Red oils:		
200-5-6	.07	.07¼
300-5-6	.07½	.07¾
500-5-6	.08¼	.08¾
750	.08¾	.09¼
1,200-5-6	.09¾	.09¾

CALIFORNIA (moving to dom. market)—

Pale oils:		
100-2½-3	.07¼	.08
200-2½-3	.07¼	.08
300-2½-3	.07¼	.08
400-3-4	.07¼	.08
450-3-4	.07¼	.08
550-3-4	.09	.11
600-3-4	.09	.11
Red oils:		
200-4-5	.07¼	.08
300-5-6	.07¼	.08
350-5-6	.09¼	.11½
400-5-6	.09¼	.11½
450-5-6	.09¼	.11½
500-5-6	.09¼	.11½
600-5-6½	.09¼	.11½
700-6½ plus	.09¼	.11½
750-6½ plus	.09¼	.11½
900-6½ plus	.09¼	.11½

PENNSYLVANIA—

150 vis. at 70° F., 3 color, 400-405 flash:		
Zero pour point	.33	.35
10 pour point	.32	.34
15 pour point	.31	.33
25 pour point	.28	.30
200 vis. at 70° F., 3 color:		
Zero pour point	.35	.37
10 pour point	.34	.36
15 pour point	.33	.35
25 pour point	.30	.34

Wax and Petrolatum

(Prices per pound)

OKLAHOMA (Group 3)—

124-126 (A.m.p.) w.c. scale	.0675	.0687½

PENNSYLVANIA (Inland refineries)—

122-124 (A.m.p.) w.c. scale	.0675	.0700
124-126 (A.m.p.) w.c. scale	.0675	.0700

NEW YORK—

Wax in bags fully refined:		
123-125 (A.m.p.) wax	.0635	.0640
125-127 (A.m.p.) wax	.0650	.0655
128-130 (A.m.p.) wax	.0665	.0675
130-132 (A.m.p.) wax		.0700
133-135 (A.m.p.) wax	.0720	.0730
135-137 (A.m.p.) wax	.0755	.0760
Crude scale:		
124-126 (A.m.p.) w.s.		.0700
124-126 (A.m.p.) y.s.		.0700
Petrolatum in barrels, carload lots:		
Dark green		.03½
Amber		.03⅝
Extra amber		.04
Lily white		.06½
Snow white		.07⅝
Cream		.05½

Export Prices

GASOLINE

GULF COAST—

U. S. Motor	.05	.05¼
60-62 400	.05½	.06
65 octane	.05¾	.06½
68 octane	06	.06¼
70 octane	.06½	.06⅝

LOS ANGELES—

U. S. Motor grades:		
60-65 octane	.05½	.05¾
65-69 octane	.05¾	.06¼
Above 69 octane	.06¼	.06½

KEROSENE

GULF COAST—

41-43 prime white		.05¼
41-43 water white		.05¼

LOS ANGELES—

41-43 water white	.05	.05¼

LUBRICANTS

(Pennsylvania Grade)

NEW YORK (f.o.s.) in bbls.—

Cylinder stocks:		
600 S.R. unfiltered	.25	.26½
650 S.R. unfiltered	.27	.28½
600 flash, S.R.	.28	.30½
630 flash, S.R.	.30	.34
Bright stock:		
8 color	.40	.42

NEUTRAL OIL

200-3 color	.38	.43
150-3 color	.37	.40

PARAFFIN WAX

NEW YORK (prices per pound)—

123-125 A.m.p.		.0700
125-127 A.m.p.		.0750
128-130 A.m.p.		.0775
133-135 A.m.p.		.0850
135-137 A.m.p.		.0900
Crude scale:		
122-124 w.s.		.0650
124-126 w.s.		.0700
122-124 y.s.		.0675
124-126 y.s.		.0700

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LEASES—East Texas, La., South Ark. 20 acres up, dollar acre up.—Owners—Address Attorney, Box 1122, Little Rock, Ark.

BROKERS and SALESMEN
only
A complete SERVICE EXPERTS in every department of the Oil Business at your SERVICE a REAL SET-UP. The best opportunity ever offered you. Leases in large or small lots at
WHOLESALE PRICES
Write today and get started right.
OIL BROKERS EXCHANGE
200 Don Juan Bldg., Santa Fe, N. M.

SACRIFICE 40-acre Oil Lease, Chaves County, for only $10.00, full price. Guarantee title. P. O. Box 191, Clovis, N. Mex.

NEW MEXICO WEEKLY OIL SCOUT REPORT. — Send for sample copy. Roy G. Barton, Box 968, Hobbs, N. M.

FOR SALE Oil and gas leases and small production located in Kentucky shallow field, and leases located in Clay County, Tenn. Have for sale two tracts of proven Fluorspar and Zinc deposits; reports furnished on request. W. P. Harley, Bowling Green, Kentucky.

NEW MEXICO
STATE OIL AND GAS LEASES
Buy on known structures where major companies own leases. 50c per acre. 5c rentals. Write for information.
HARRY S. WRIGHT, STATE LESSEE
Wright Building
FARMINGTON, NEW MEXICO

WANT CAPITAL to invest in perpetual mineral rights in North Permian Basin in Texas and New Mexico in major company blocks on geophysical highs. Rapid development under way now. Now is the time to invest as mineral rights will be much higher after development starts on each block. Real opportunity. Address Box K-391, The Oil and Gas Journal, Tulsa, Oklahoma.

PRIVATE CAPITAL available up to $75,000 for oil and mining ventures. Principals only. Address Box K-390, The Oil and Gas Journal, Tulsa, Oklahoma.

CAPITAL WANTED
One hundred proven Oil Locations three to seven hundred feet drilling, settled production twenty barrels daily, good sand, well's pumping for fourteen years. Will pay ten per cent, assign one-eighth interest, assign run tickets, wanted twelve thousand dollars, should pay out in twelve or eighteen months, Reference if wanted. Write Box 35, Somerset, Kentucky.

MISSISSIPPI DRILLING BLOCKS
Will give half interest in three Mississippi blocks for test well on each to the Tinsley pay, 5000 feet, unless production found lesser depth. Kemper County 24,000 acres. Leflore County 20,000 acres. Sunflower County 18,000 acres. All in the southern Upper Cretaceous Basin, the most actively exploited part of the state. Address 216 Atlas Bld., Shreveport, La.

Leases and Drilling Blocks

EAST Texas Oil and Gas leases. Several small tracts—total 45 acres. C. W. NEBEL, 813 N. 6th St., Longview, Texas.

EAST TEXAS Trinity sand wildcats will drill shortly Humble, Shell and Texas company blocks afford chance quick money. Leases-Royalties. E. CROFT, PROCTOR, TEXAS.

ALABAMA 14000 acres for development by reliable Co., no promotions. Well blocked and in three ownerships. 325 N. 14th St., Manhattan, Kansas.

SEVERAL Thousand Acre choice leases for finances to drill 2nd well to Pennsylvania pay. 42 gravity oil proved. No better geology anywhere. G. Flessa, 228 E. Martin, San Antonio, Texas.

WANTED
Drilling contractor with good portable Rotary or Cable Tool Rig to drill 2200-2300 feet for production in Western Nebraska.
Write
J. R. Paterson, Ogallala, Nebraska

HAVE OIL and gas leases, located on structure, near new discovery oil pool, will assign for reasonable figure and drilling commitment, depth of drilling 500 to 600 feet. If interested write
C. J. DAVIDSON
Campbellsville, Kentucky.

WANT KANSAS ACREAGE
Close production 1200 to 3000 ft. Send plots and details immediately. Address Box K-420, The Oil and Gas Journal, Tulsa, Oklahoma.

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CAPITAL SEEKERS
Put your project before 260 Key-Men. Cost trifling. Details free. AMSTER LEONARD, Fox Theater Building, Detroit, Michigan.

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REMEMBER EAST TEXAS
When all other methods fail, employ my divining or dowsing method. If oil exists this method finds it. Faults, broken treacherous areas accurately defined. Our Watson #2, first producer Wilmington, Calif. field, located by this method. More reliable than mechanical geophysics. Ask any unbiased oil authority. Many years experience. A wise man investigates. George Miller, 1548 Post, Torrance, Calif.

Wanted

WANTED
FROM PRINCIPALS ONLY
Crude Oil—Diesel Oil—Bunker C
Aviation and Motor Gasoline for Export.
JOHN PAUL GIBSON
522 Fifth Avenue New York City.

Situations Wanted

REFINERY DESIGNING ENGINEER, 17 years' experience. Desires change. At present employed, Chief draftsman major oil company. Address Box K-380, The Oil and Gas Journal, Tulsa, Oklahoma.

MANUFACTURERS REPRESENTATIVE
An experienced and well acquainted salesman desires additional lines to sell, in Mid-Continent Area. Commission or Salary. Box K-291, The Oil and Gas Journal, Tulsa, Oklahoma.

SEVERAL years experience, petroleum technology, chemical research, development, plant. Capable of initiating and carrying on. Wants similar position or as asst. supt., or in contributing or derivative industries. Now unemployed. Address Box K-421, The Oil and Gas Journal, Tulsa, Okla.

BUSINESS MANAGER for independent oil company or Drilling Contractor. Considerable experience in leasing, acquiring contracts, financing, and business administration. P. O. Box 66, Sta. A, Los Angeles, California.

Help Wanted

ENGINEER with design experience in petroleum refining work, wanted. Address Box K-393, The Oil and Gas Journal, Tulsa, Oklahoma.

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TEXAS and NEW MEXICO
UP-TO-DATE OIL DEVELOPMENT MAPS
Zingery Oil Map Co., Fort Worth, Tex.

R. B. ROBINSON MAPS
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SINCE 1908 Burkhart's legal forms—servicing Mid-Cont. oil fields, including Ill., La., Mo., Ind. & Ky. Free catalog & samples. Burkhart Ptg. & Sta. Co., 115 So. Cinn., Tulsa, Oklahoma.

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All offerings meet S.E.C. requirements.
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Tulsa Loan Bldg., Tulsa, Oklahoma.

WILL PAY CASH for large or small amounts of producing Royalty in West Texas and New Mexico, Mid-Continent Royalty Co., Tulsa Loan Bldg., Tulsa, Oklahoma.

Oil Industry Printing

OIL FIELD LEGAL BLANKS
Leases, assignments, releases, township plat books, well records, etc. Request on your letterhead gets free catalog. Olds Press, 215 East Third St., Tulsa, Okla.

For Sale—Geologic Surveys

FOR SALE—Geologic Surveys. Largest Stock of U. S. and State Geologic Surveys in country. Send list of wants to Cornwall's Book Store, 723 Eleventh Street, Northwest, Washington, D. C.

Ranches—Farm Land

6140 ACRES
Located in the heart of the blue-stem grass area in the Flint Hills of Kansas. A ranch with good reputation for fattening cattle. Owned by a group of bondholders who are anxious to liquidate this property. Ray D. Jones, 310 Ward Parkway, Kansas City, Mo.

Equipment Wanted

WANTED — Miniature cracking plant complete. State condition, capacity and price. Hot Springs Refining Co., Hot Springs, South Dakota.

WANTED: Stabilizing tower 24" to 30" x 50'; 24 to 30 trays, working pressure 300 lbs. Also reboiler and control equipment. Write 832 Nat. Bank of Tulsa Bldg. Pho. 7769, Tulsa, Oklahoma.

MACHINERY WANTED
Wanted good used American or Lodge & Shipley 10" Hollow Spindle Lathe. Details to Shop Supt. % Bridgeport Machine Co., Box 730, Wichita, Kans.

For Sale—Equipment

FOR SALE—One 5000-Barrel Bolted API used Steel Tank with steel stairway and landing .Two 500-barrel bolted API used Steel Tanks in first class condition. Bought new one year ago. Now set up Birk City field, Henderson County, Kentucky. Will sell all or part at half original cost. J. L. Lambert, Henderson, Ky.

SULLIVAN P2 Steam Diamond Drill with approximately 2400 feet 2⅛" drill pipe and assortment of tools. Equipment in bad shape due to rust. Cost new about $13,000. For sale as is, Houston, Texas, $1,500.00. Humphreys Investment Co., 910 First Natl. Bank Bldg., Denver, Colo.

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Classified advertising rates: First insertion, 35 cents a line; each additional insertion, 25 cents a line, PAYABLE IN ADVANCE. Six words usually make a line. Count as a word each one-letter word and each group of figures. White-space computed at regular line rate. Allow two extra lines for blind ads. Ads of less than three lines not accepted. No formal acknowledgement is made, and proofs cannot be shown in advance of publication.

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6 Lines	2.10	3.60	5.10	6.60
7 Lines	$2.45	$4.20	$5.95	$7.70
8 Lines	2.80	4.80	6.80	8.80
9 Lines	3.15	5.40	7.65	9.90
10 Lines	3.50	6.00	8.50	11.00

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THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

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COMPLETE 3,000 BBL. SKIMMING PLANT — RUSSELL, KANSAS

Foster Wheeler Fractionating Column — 6'6"1Dx72' high. New Taylor Instruments throughout. Heat Exchangers, Hot Oil Pump Steam Engine Driven, Two Pipe Stills. 1 - 3" Tubes—1 - 2½" Tubes.

WILL SELL ALL OR ANY PART

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SONKEN-GALAMBA SUPPLY COMPANY

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Robt. W. Duden,
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A Made-to-order Plant — for YOUR Business!

Ideally situated in Southern Illinois near the oil producing section, all or part of 150,000 square feet of floor space with 10 acres of ground. Connected concrete buildings with concrete floors and roofs. Completely equipped with modern heating system, automatic boiler, sprinkler system and fully wired for electric light and power. Unusual facilities for river, rail or truck transportation. For details and attractive price, write.

BOX K-410
The Oil and Gas Journal, Tulsa, Oklahoma

WE OFFER—STEEL DERRICKS
Fresh Painted—Excellent condition.
We still have a few left.
WERTZBERGER DERRICK CO.
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Tulsa, Oklahoma

FOR SALE—$80,000.00 Rotary Rig complete. 10-in. Emsco Unit, 125-350 Boilers, etc. Practically new. Bargain. Roberts Bros., Box 1726, Houston, Texas.

"Motor Sale" use LUBRICATING GAS-O-LINE AND SAVE

3 to 6c on GASOLINE. 25 to 40% Motor Expense. Original and Genuine lubricating Anti-Knock Additive.

Mixture makes cheap GASOLINE good, and high-test Gasoline better, or highest powered Gasoline on American Market. Prove it for yourself. Introductory Delivered Price 99c on $2.50 package. Responsible Dealers Wanted.

LUBRICATING GASOLINE CO., HOUSTON, TEXAS

FOR SALE—At Bartlesville, 10-20 McCormick Deering tractor with Shaffer front end senior Bearcat Winch; at Oklahoma City, 1—Muskogee Model "B" Skid type well service machine with PA-100 International Motor. I.T.I.O. Company, Bartlesville, Oklahoma.

FOR SALE: Complete 2-speed American steam rotary drilling rig with 4,000 feet of drill pipe. This rig can be purchased at a sacrificed price. Also G. E. drilling motor 15-35 h.p. complete with speed controls. Address Hightower Oil & Refining Corporation, Box 830, Brownwood, Texas.

TWO 240 H.P., 180 R.P.M., Type A, Busch-Sulzer Diesel engines, connected in tandem by a clutch, quill shaft and sheave. One engine has a belt driven 187 K.W., 220V., 2 phase A.C. generator, all in good operating condition, and can be used separately. STANARD-TILTON MILLING COMPANY—Dallas, Texas.

COMPRESSOR CYLINDERS
2—26" x 20" Ingersoll-Rand.
1—8", 12—17⅛" x 20" Bessemers.
2—6⅛", 1—7¼", 1—12 3/16" Clark.
3—18⅛" x 20" Clark.
Located at our Seminole, Okla. Branch.
All Reshopped and Ready to run.
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25 K.W. and 40 K.W. Gas Engines, 220 volts, D.C. Two 100 K.W. Gas Engine-Generator Sets, 220 volts, D.C. 7x6 Ingersoll-Rand ER-1 Air compressor. Six-inch Oster Pipe Threading Machine. Also large stock of lathes, pipe machines, milling machines, etc. Send for our list.
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Freight Cars; any kind
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Freight Car Repair Parts
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OTHER MACHINERY and EQUIPMENT, TOO!

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"Anything containing IRON or STEEL"

THE MOST PERFECT light transport airplane ever designed for use of a busy field executive. VULTEE 10-place transport with R1820 F 52 cyclone 890 HP and constant speed 3 blade propeller. Complete airline and night flying equipment. 3 radio receivers; one an automatic radio compass. Special 100 watt RCA transmitter. 1200 mile range with 256 gallons gasoline. Spare engine and propeller. Ship and equipment in first-class condition. Time 450 hours. Engine being majored at factory Jan. 1, 1940. Recent 10,500 mile trip made with 8 passengers with total operating cost exclusive of pilot's salary $741.00. R. W. Lyons, Shoreham Bldg., Washington, D. C.

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50 H. P. MUNCIE oil engine number one condition. And Gould 5½ by 12 Triplex high pressure pump. Either direct or belt drive. This engine and pump will make an ideal and highly economical unit for water flooding. We can show you a similar unit in operation which has proven to be compiely satisfactory. Price $1250.
M. J. REGAN,
Phones 599 and 448, Coffeyville, Kansas

EQUIPMENT FOR SALE
2—Used Full Electric Diesel Powered Drilling Rigs—Complete with Drill Pipe.
1—Used Complete Steam Drilling Rig—Complete with Drill Pipe, A-1 Condition.
1—Complete Power End consisting of two 240-HP Fairbanks-Morse Engines with Sheldon-Burden Transmission for deep well drilling. Bargain.
For Inventory and Prices call or write
K. S. RICHARDS
P. O. Box 830 Fort Worth, Texas
Phone 2-1161

REFINERY FOR SALE—complete 3000-bbl. refinery, cracking and skimming plant, practically new, dismantled and ready for shipping, at sacrifice price. Louisiana Iron and Supply Co., Phone LD 21, Longview, Texas.

FOR SALE WALSH and Weidner Gas Fired Water Tube Boiler 55 H.P., 500 pounds working pressure, excellent condition. J. R. Phillips, 1647 11th Place South, Birmingham, Alabama.

FOR SALE
35,000 ft. of 3" Pipe
10,000 Ft. of 8"
25,000 Ft. of 2"
10,000 Ft. of 6"
20,000 Ft. of 4"
10,000 Ft. of 2½", all threaded and collared line pipe strictly No. 2 located in Shreveport, La.
Also have 30,000 ft. of 6" screw line pipe in Oklahoma and 10,000 ft. of 8" in Missouri.
Wire, Write or Phone for Prices.
Louisiana Iron & Supply Co.
Shreveport, Louisiana

WILL SACRIFICE: Good used 100 h.p. gas engine $350, 20 tons mostly 24" I Beams $22 a ton if all taken, 75 h.p. steam engine $150. Reduction who buys all. B. C. STRIZ, Box 712, San Antonio, Texas.

FOR SALE AT BARGAIN PRICES: One 225 H.P. Cummins Diesel Engine. One 225 H.P. Buda Diesel Engine. These are complete power units. General Machine & Supply Co., Wichita Falls, Texas.

FOR SALE—Seminole, Oklahoma, warehouse steel portable building 20' x 86' x 10' and 18'. I. T. I. O. Company, Bartlesville, Oklahoma.

ELECTRIC Welders—Lincoln Arc, rebuilt, gasoline engine driven; capacities 200, 300 and 400 amp.; low prices.
FUNKHOUSER EQUIPMENT CO.,
2425 Jefferson St., Kansas City, Mo.

Rocky Mountain Runs

Production estimates for week ended December 23:

WYOMING

	Bbl.
Salt Creek	15,550
Big Muddy	1,170
Badger Basin	140
Cody dome	60
Cole Creek	50
Dallas Derby	570
Dewey dome	10
Dutton Creek	30
Elk Basin	670
Frannie	3,670
Garland	2,530
Grass Creek	1,800
Hidden dome	70
Hudson	240
Iron Creek	10
LaBarge	990
Lance Creek	22,540
Lost Soldier	1,620
Mahoney	250
Medicine Bow	1,400
Mule Creek	190
Oregon Basin	3,220
Osage	600
Quealy dome	500
Rock River	2,510
Teapot	20
Warm Springs	140
Wertz	3,610
Total Wyoming	64,160

MONTANA

Border	200
Cat Creek	490
Cut Bank	10,860
Dry Creek	970
Kevin-Sunburst	4,410
Pondera	850
Total Montana	17,780

COLORADO

Florence	150
Fort Collins and Wellington	290
Wilson Creek	460
Iles dome	1,860
Moffat	360
Orchard	20
Rangely	90
Tow Creek	150
Price	510
Total Colorado	3,890

NEW MEXICO

Cooper	3,600
Eaves	810
West Eunice	180
Eunice	20,350
Halfway	90
Hardy	3,530
Hobbs	10,330
Jal	630
Langlie	4,960
Lynch	460
Lynn	900
Mattix	5,300
Monument	21,510
North Lynch	20
Penrose	4,690
Rhoades	60
Skaggs	90
Skelly	1,780
South Eunice	4,100
South Lovington	1,310
Vacuum	11,410
Artesia-Maljamar	13,390
Getty	100
Hogback	200
Rattlesnake	580
Table Mesa	80
Total New Mexico	110,460
Total Rocky Mountain region	196,290

Turner Valley Gas System

CALGARY, Alta.—An order issued by G. M. Blackstock, chairman of the Alberta Public Utilities Commission, requires the immediate installation of a modern pipe-line system in the oil-field town of Turner Valley, to facilitate delivery of scrubbed gas at proper pressures. The commission at the same time formally approved an arrangement under which the Valley Gas Co., Ltd., will take over the business of gas distribution in the community.

Originally, raw natural gas was distributed by the McLeod Oil Co. at a flat rate of $4 per month for each stove in use. Later the McLeod company sold its gas wells to the Royalite Oil Co. Under the new arrangement the Valley Gas Co. will construct a pipe-line system costing approximately $50,000 and will handle distribution, taking delivery of scrubbed gas from the Royalite Oil Co. on a meter basis at the same price charged the Canadian Western Natural Gas Co.

Canadian Fields

(Continued from Page 357)

proximately 600,000 cu. ft. a day before it was shot. Union's No. 30, Lot 12, Concession 5, finished at 1,100 ft. with close to 2,000,000 cu. ft. natural daily production. Union's No. 31, Lot 22, Concession 5, finished at 1,070 ft. with 700,000 cu. ft. a day natural production. Union's No. 32, Lot 30, Concession 5, finished a small gasser at 1,050 ft., around 200,000 ft. a day, and was left standing without a shot.

In the De Clute field, Kent County, Gas Producers Syndicate, Gil Pardo farm, Lot 139, South Talbot Road, Raleigh Township, finished at 1,540 ft. with 3,500,000 cu. ft. a day or better.

McGREGOR

12 Different Types of Working Barrels

OUR aim is to satisfy our customers by supplying them with a complete line of equipment for pumping wells. Our line includes:
Brass, Steel and Cast Iron Working Barrels
New "MAC" Plunger Barrel
Working, Standing and Drop Valves
Balls and Seats, etc.

Send for Booklet

McGREGOR WORKING BARREL COMPANY
Bradford, Pa., U.S.A.

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